# Electrical Review

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# Summary of 1920 Developments in the Electrical Industry

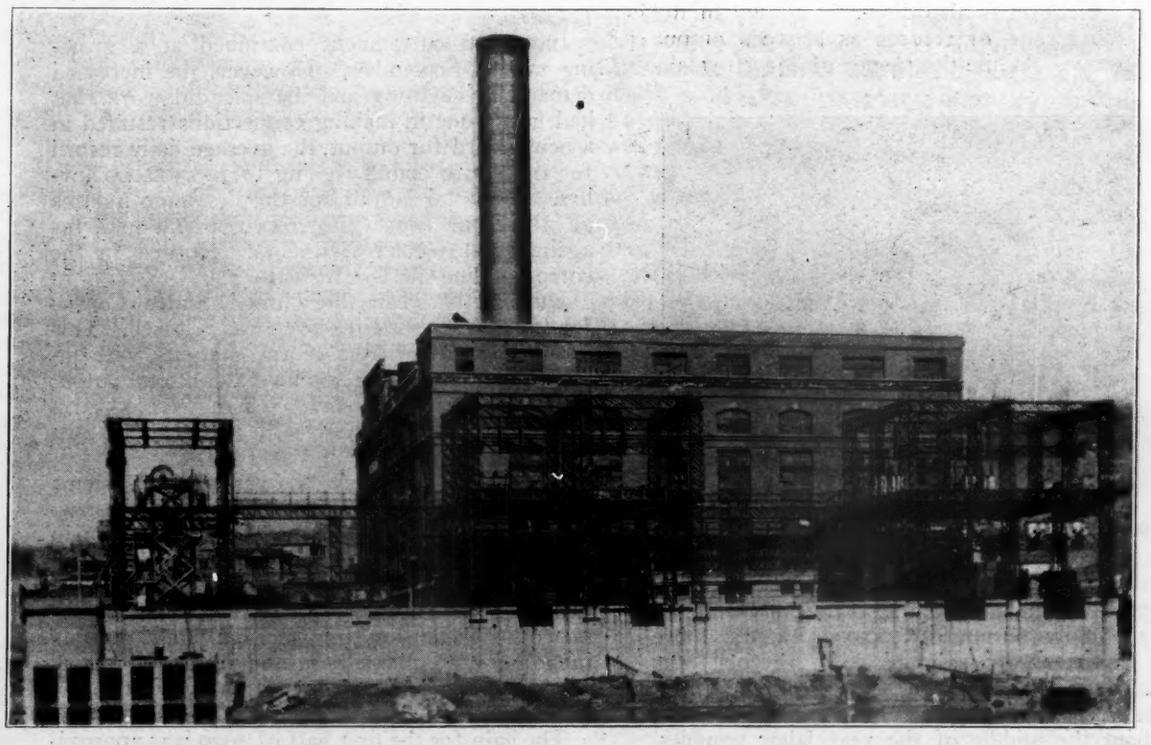
## Great Strides Made in Both Technical and Commercial Fields—Curtailed Production Diminishes Record Business Volume—Central Stations Make Good Showing—Use of Appliances Increased

By AINSLIE A. GRAY

Probably no other year in the history of the electrical industry opened with greater promise of record achievement in every department than 1920. Recovering quickly from the effects of the war business was resumed on a grand scale in 1919, and the impetus gained by the end of that year made the outlook for the year just closed one of great possibilities.

From both technical and commercial viewpoints the industry has made tremendous strides. Much that war needs brought to the development stage has been put to the actual test of service, and much that the war deferred has now had a chance for development. Underlying all has been a higher regard for quality in finished products and a greater devotion to scientific methods of investigation in the development of data on which fundamental improvements in design and construction have been based.

Commercially the industry has rolled up new records in production and in value of manufactures. Great, however, as these totals are they fall far short of what might have been had the industry been able to respond to the overwhelming demand at the time of its peak. Shortage of many materials of construction, railroad congestion, labor troubles in the industries upon which electrical manufacturers depend for many components and a low ratio of production in our own plants all conspired to hold back deliveries until the buying momentum was largely spent. The result has been a rapid approach to normal con-



Modern Generating Station With Outdoor Transformers and Switching Equipment.

ditions of supply, an improvement in productive efficiency and an industry splendidly equipped to meet the future.

Despite a country-wide slacking in industry during the last three months of the year and a cautious period of buying, electrical manufacturers generally report good volume for the year. Collections were very good until Oct. 1 and not particularly bad subsequent thereto. For the last quarter there has been a greatly diminished demand in orders of any magnitude.

The billings of the General Electric Co. for the first nine months of 1920 amounted to about $200,000,000. It is estimated that gross earnings for the year will be about $270,000,000, compared with $229,900,000 in 1919. The billings of the Westinghouse Electric & Manufacturing Co. for the six months period from April 1 to Sept. 30, 1920, amounted to $78,771,675. The sales billed during the previous year ending March 31, 1920, totaled $136,052,092, indicating that the current year's business will be in excess of last year's.

The year made new records in the sales of appliances. Heating-device sales jumped from $18,000,000 in 1919 to $28,000,000 in 1920; vacuum cleaners from $20,000,000 to $35,000,000, and washing machines from $50,000,000 in 1919 to an estimated $100,000,000 in 1920.

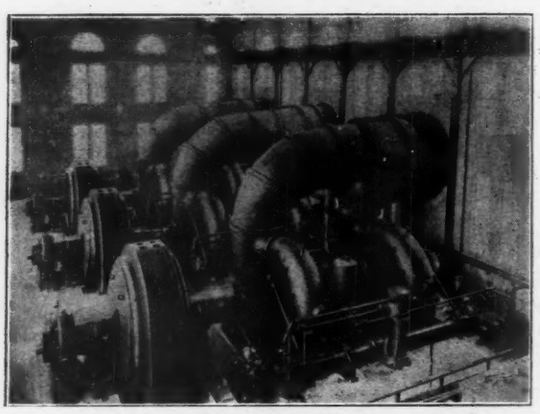
Electrical exports were maintained in good volume, the departures for the first ten months of the year totaling $78,317,629, compared with $75,695,023 for the same period in 1919.

# Central Stations

## Industral-Power Demand Increases—Relative Importance of Illumination Being Overcome—Progress Made Despite Handicaps—Extensions Needed

With industry in general working at maximum capacity the central stations of the country began the year showing gains over the months immediately preceding and promising to roll up another banner record in output and revenue. Early in the year, despite severe weather conditions, seasonal variations in illumination requirements and unusual car shortage—factors tending to materially lower station output—the central stations reported gains in both revenue and output. The record of the year demonstrated more clearly than ever that the central-station industry cannot be reckoned in terms of illumination requirements alone. The growing demand for industrial power and for domestic power and service requirements other than illumination is overcoming the relative importance of the illuminating branches of the industry.

This condition is also distinctly shown in the diminishing ratio of returns as between output and revenue. While the month of March established a new record of 3,858,000,000 kw-hrs. for 70% of the industry reporting, showing an average daily output of 100,000 kw-hrs. more than January, the average daily revenue was about $280,000 less than that recorded during January.



Generator Room in Large Central-Station Plant.

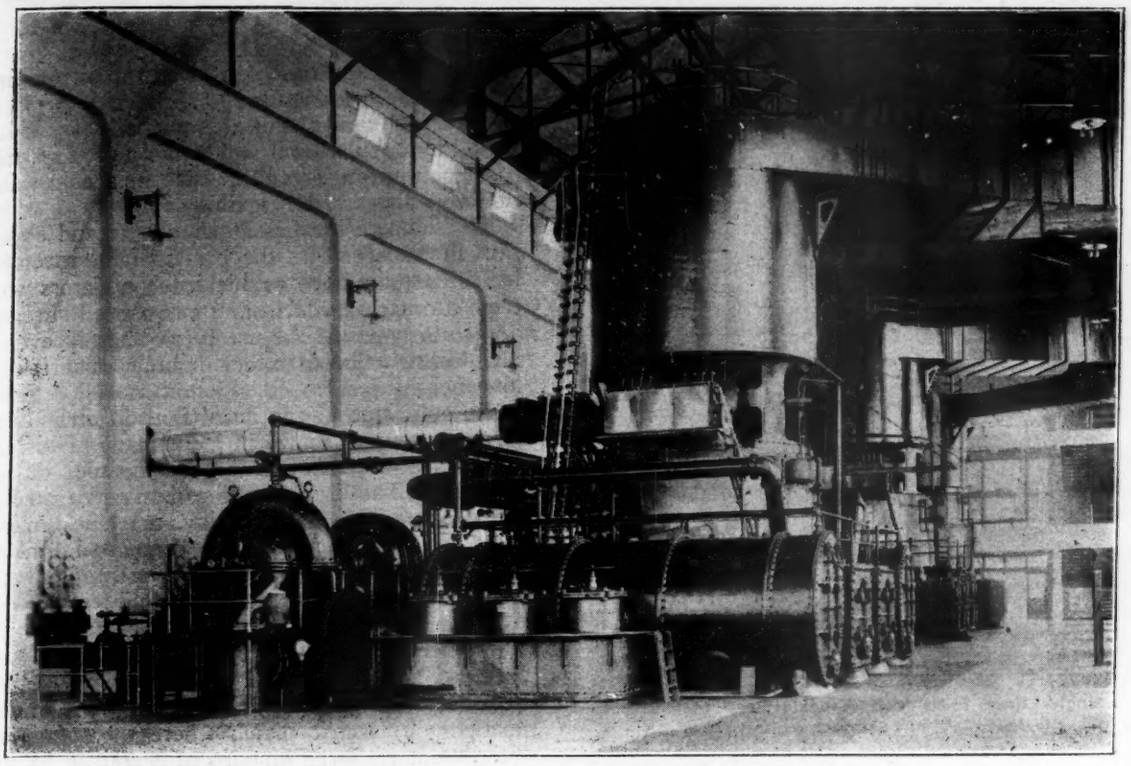
About the middle of the year labor troubles, railroad congestion, decreased industrial requirements and falling off in the lighting demand resulted in a drop of about 2,600,000 kw-hrs. in the average daily output. June showed considerable improvement, the average daily output for the first half of the year coming up to 123,600,000 kw-hrs. At no time during this period did the daily output fall below 120,000,000 kw-hrs. Another interesting commentary is the clear indication of the leveling effect on central-station operation of the increasing power load. An extreme range of only 5,000,000 kw-hrs. in average daily demand was recorded as between winter and summer. Notwithstanding curtailment of industry in July and August the central stations showed unusual stability during these months, for the first time in the history of the industry the average daily output being in excess of 125,000,000 kw-hrs.

Industrial curtailment continued at a growing rate in September. However, the increased demand for lighting and the splendid work that had been done in making connections resulted in a new record for output, the average daily record for the entire country going to 128,300,000 kw-hrs. The total output for the first nine months of the year was 34,070,000,000 kw-hrs., as against 28,010,000,000 kw-hrs. recorded in the corresponding period in 1919.

During the year the United States Census for Central Stations for 1917 was released. This showed a total of 6542 central stations, with installed rating of 8,994,407 kw., and a total output of 31,044,049,234 kw-hrs. There were 555,924 stationary motors served, with a continuous rating of 9,216,330 hp.

In 1919 there were 27 generating systems whose yearly output exceeded 400,000,000 kw-hrs. The 7243 companies reported operating in the United States generated 39,559,000,000 kw-hrs. of energy and employed over 100,000 men. This energy was carried over more than 87,000 mi. of high-tension transmission lines, serving in addition to many thousand industrial plants approximately 7,000,000 homes and over 1,000,000 business offices, stores and small factories.

The gain for the first half of 1920 was approxi-



Interior View of Turbine Room in Modern Central-Station Plant.

mately 17%. Despite serious retrenchments in industrial operations during the last four months of the year it is expected that this gain will be maintained so that the output for the whole year should run to about 47,000,000,000 kw-hrs. Based upon a population of 110,000,000, central stations reach about 63,000,000, or 57% of the population. Figuring 5.2 persons per dwelling there are about 13,000,000 dwellings in the territory covered by central-station lines, of which 7,000,000 are wired. In all the states there are 21,000,000 dwellings. This leaves 6,000,000 dwellings adjacent to central-station lines not now electrically wired, and 8,000,000 more to which service must ultimately be extended, not considering the natural growth of the country at all.

At the present time there is hardly a central station in the country that can meet the demands upon it for extensions and increased capacity. Only by the most ingenious dispatching and long-headed control of the diversity factor have a great many been able to meet community demands. In the face of strictures imposed by regulating bodies with regard to utility earnings, and the long time that must elapse during construction periods before investments may proceed upon a basis of earning any rate of return whatever, utilities have had a serious time financing extensions which are necessary if the industry is to meet its opportunities and its obligations.

The extremely difficult coal situation during the year and high prices have forced attention upon better coal-burning methods. The use of mechanical stokers has made steady progress, last year's expenditure for stokers amounting to about $10,000,000. The orders during 1920 have run above this figure not only because of higher unit prices but because the stoker market has been more active during the first eight months of the year. Pulverized coal is gaining steady headway. The Oneida street installation of the Milwaukee Electric Railway & Light Co. has made good after one year's operation, and the Lakeside plant containing eight 1306-hp. boilers was placed in operation at the close of the year. A number of other powdered-coal installations are under way, notably that at the River Rouge plant of the Ford Motor Co., comprising eight 2400-hp. boilers.

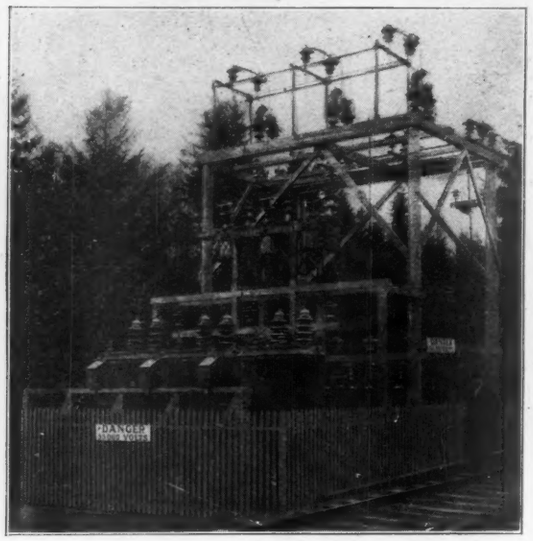
Much in the way of extension and improvement has had to be abandoned due to high interest rates. Despite this the year has witnessed considerable financing of light and power companies, the recorded total for the first six months of the year being $172,501,440, with the prospects of the whole year reaching between $350,000,000 and $400,000,000.

# Electrical Apparatus

## Tendency Towards Larger Units—Increased Station Protection—Improvements in Insulators and Cables—Electric Vehicles and Ship Propulsion

The development of apparatus continues to maintain a balance between the ingenuity and daring of man and the physical characteristics of the materials of construction available, coupled with far-sighted analysis of the economies of various methods of energy production, control and distribution. Design and construction of mammoth prime movers for steam and water

operation bring about grave problems relating to steam economy and conservation of water resources. The building up of mighty generators involves new problems in station-protective ap-



Single-Phase 55,000-Volt Transformers in Outdoor Service.

paratus, automatic control, excitation and transmission-conductor support and insulation. The tendency is always toward larger units, and the year has seen some very interesting and important progress in this direction.

The largest single-shaft, single-barrel, steam-turbine units recently built in this country are for an output of 45,000 kw. at 1200 r.p.m. for 60-cycle generators, and 35,000 kw. at 1500 r.p.m. for 25-cycle generators. The record is held in Europe where two single-shaft, single-barrel units to drive 50,000-kw. generators have been built. There are two single-unit turbogenerators in operation in this country in the power station of the Detroit Edison Co. designed for an output of 45,000 kw.

Generator failures have been less frequent. The practice of embedding small resistance coils, or sometimes thermocouples, at one or more places where high temperatures are to be expected is becoming more common. The provision of adequate circulation of washed and cooled air has accomplished a great deal and, where high temperatures have developed, the practice of keeping machines well cleaned, provision for quickly opening the field, and methods of instantly stifling combustion with either steam or water have kept down losses to a minimum not previously attained.

The use of individual exciters forming part of the generator unit appears to be gaining favor. These are usually compound wound and are provided with automatic regulators.

Very large transformer units are now being built. Single-phase, 25-cycle, 8000-kv-a. units of the self-cooling type are in use outdoors. Three-phase, self-cooling transformer units have been built up to 12,000-kv-a. capacity. Single-phase units with water circulation have been built with an output of 23,600 kv-a. These are 132,000-volt transformers, with an efficiency of 99%. They measure 22 ft. from the floor to the top of the terminals and occupy a floor space 10 ft. 3 ins. in diameter.

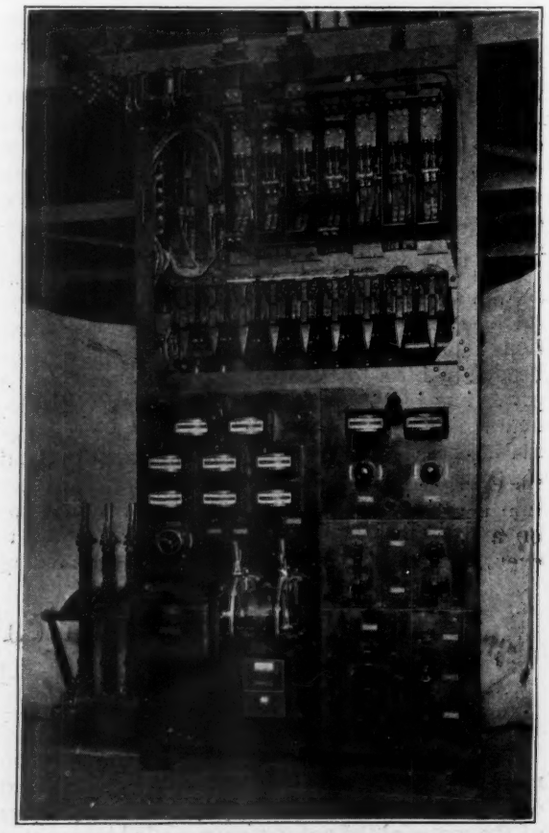
Much attention has been given to the question of adequate cooling and circulation of oil in transformer tanks, and the method of cooling the oil by circulating it under pump pressure and passing it through cooling coils in a cold-water reservoir appears to be gaining favor.

To eliminate the possibility of fire and explosion in transformers the principal improvement has been to remove unshielded conductors with their corona hazards from above the oil surfaces and to discontinue the use below the oil level in tank construction of solder or other materials of low melting point.

An indication of continued faith in turbines of large capacity is shown in a summary of turbine orders placed with two large companies during the year. The list includes a number of 20,000, 25,000, 30,000 and 35,000-kw. machines in the single-cylinder type and one compound unit of 60,000-kw. capacity. This last mentioned machine is one of the largest ever built.

There is a tendency to build larger and larger hydroelectric plants, but medium-sized powers are also being developed extensively. Attention is also being given to the development of automatic hydroelectric plants where there are low heads and no large amount of water to be impounded. Single wheels of approximately 40,000-hp. capacity have been installed, and larger ones are contemplated. One large manufacturing company reports over 300,000 kw. in large units on order and started during the past year.

The use of automatic substations for light and power is rapidly increasing, and outdoor substations are growing in favor. Increasing oil-cir-



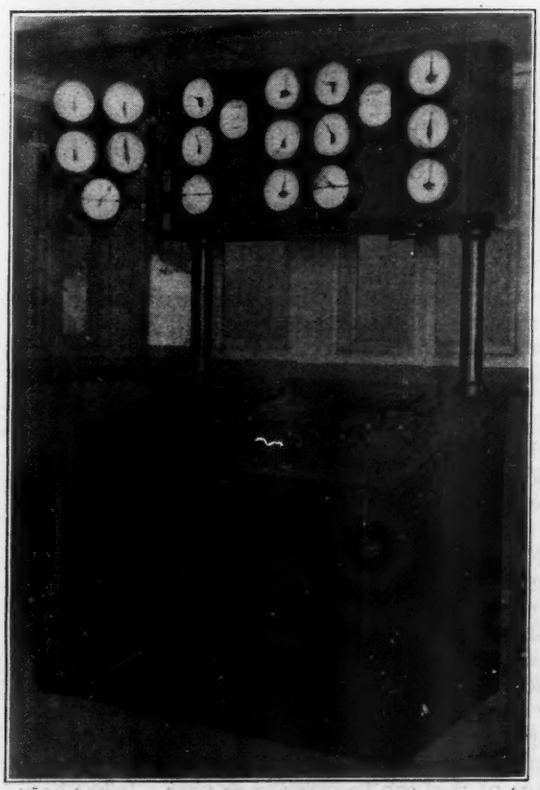
Control Panel on Electrically Driven Merchant Ship.

cuit-breaker capacity is a development of the past year, a standard oil breaker, equipped with pressure vents, hollow contact rods and an improved liquid for quenching the arc showed greatly increased rupturing capacity under test.

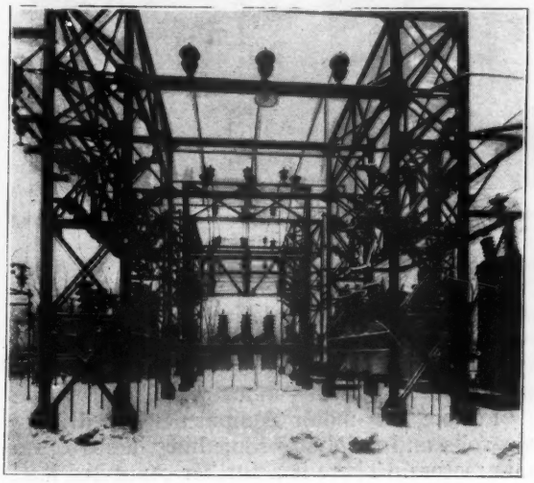
The heaviest circuit-breakers ever designed for 13,200-volt service will be installed by the United Electric Light & Power Co. at its Hellgate station in New York City. These will have an interrupting ability of 58,000 amperes at the arc. The disconnecting switches are gang operated, and their operating mechanisms are interlocked with the oil-breaker mechanism so that the disconnects cannot be moved unless the breaker is in the open position, thus insuring safety to the operators. The phase elements will be in rooms approximately 30 ft. apart with the operating mechanism on the floor above, thus preventing the possibility of a bus-bar short-circuit and minimizing the effects of a ground.

The largest induction regulators ever built have been installed during the year by the Philadelphia Electric Co. in order to work its 66,000-volt transmission lines at maximum load. The regulators are installed in an outdoor substation, are of rugged construction and are rated at 1750 kv-a.

Serious consideration of projects for bulk transmission of power to load centers from distant energy sources has stimulated investigation and discussion of the design, feasibility, cost and characteristics of transmission at high voltages. Present types of line insulation have been given especial study in this connection, and the probability is that structural and assembly changes must be made. For the handling of present voltages recent studies to overcome mechanical failures, particularly those due to material deterioration, have achieved some very satisfactory improvements. The problem is being attacked more and more from a scientific standpoint, with more reliable data available and improved methods and equipment for making investigations. These are



Bench Board for Control of Generators.



Typical 70,000-Volt Outdoor Substation.

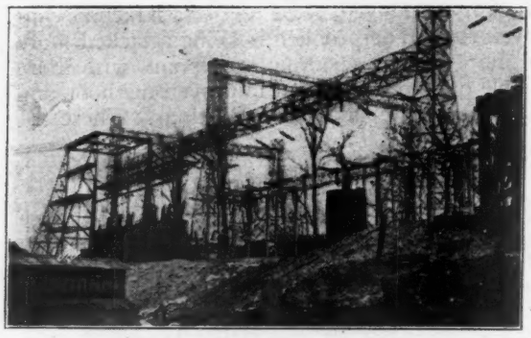
speedily resulting in a better co-ordination of electrical and ceramic characteristics on the one hand and the development of more suitable hardware on the other. Altogether, much progress has been made and much more may be expected in the future.

Collaterally, the subject of underground transmission has received more than usual consideration. For tension up to 25,000 volts, and loads up to 10,000 kv-a., from an economy standpoint the three-conductor cable seems to be favored over the single-conductor cable. Marked improvement has been made in the manufacture of underground cables so that the carrying capacity of cables manufactured today is materially greater than that of cables made a few years ago. The principal improvement is the reduction of dielectric loss at relatively high temperatures, accomplished principally as a result of a thorough study of the properties of impregnating compounds.

The development in metering instruments has been substantial along the line of devices for the measurement of kilovolt-amperes as well as demand meters. The development of an automatic potentiometer and an automatic Wheatstone bridge is also announced. Motor applications have grown apace, there having been developed some problems of real magnitude in the steel industry.

The spread of industrial operations has developed the necessity of providing for the economic distribution and utilization of large amounts of energy at points distant from the industrial power plant. In this latter connection it is interesting to note the installation of the first automatic industrial substation in the plant of the Packard Motor Co., at Detroit. A 1500-kw. motor-generator set is installed at the load center, and automatically takes the load when the voltage drops. The automatic features reduce operating cost, give improved service and reduce light-load losses.

Few realize the enormous power demands made by the iron and steel industry, and to what a



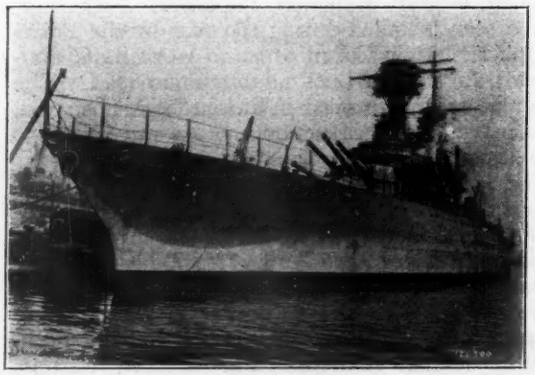
Outdoor Substation, Showing Transformers, Insulators, Structure and Bus Supports.

relatively small extent the central-station companies have entered this desirable field of heavy power consumption and high load-factor. Altogether there is about 900,000 kw. in generating capacity devoted to this industry. This is made up of some 500 motor equipments for driving main rolls and involving something like 850,000 hp. in motors. There is a further connected load of approximately 1,350,000 hp. for auxiliary drives of almost endless variations.

To the motor load of about 2,200,000 hp. there should be added the electric-furnace load, which is estimated as representing 250,000 kw. in generating capacity, the whole requiring about 900,000 kw. of generating capacity to supply it. As the electric furnace is finding somewhat greater application in foundries than in steel mills, there is, perhaps, a greater opportunity for central-station companies to take on this form of load than is the case with the motor load of the steel mills.

While the electric vehicle does not show any phenomenal growth, there has been a steady development in sales. Continued study of the relative economy of the electric and gasoline truck shows consistently that the proper application of the most economical machine is to use electric trucks within their capacity, and to use gasoline trucks only for work beyond the capacity of the electric truck. The perfection of battery-exchange schemes have done much to extend the field and range of usefulness of the electric vehicle. Complete accurate cost records of large users of both gasoline and electric trucks indicate that a 5-ton gasoline truck, operating an average of 40 mi. per day, costs approximately $5 to $10 a day more than a 5-ton electric truck doing the same work. In the industrial-tractor field the electric machine appears to be supreme, and the growth of this development of the electric-motor-propelled vehicle is little short of phenomenal.

Electric propulsion of ships is gaining headway, there being some 28 electrically driven tankers, freight ships, passenger vessels and battleships now in commission. The satisfactory performance of electrically driven ships in the United States Navy has determined the award recently of a number of new contracts for electrical machinery to propel the new battleships and battle cruisers.



Battleship Tennessee Being Provided With Electric-Propulsion Machinery.

# Super-Power Plans

## North Atlantic Seabord Project Developed During Year—Interconnection Increases, Tying Together Vast Networks of Distribution Systems

The economical supply of power through the interconnection of networks of distribution has received prime consideration and much progress has been made. The super-power plan for the industries and the railroads of the North Atlantic seaboard has gained impetus through organization of the engineering staff which is to make an investigation and report under the auspices of the United States Geological Survey.

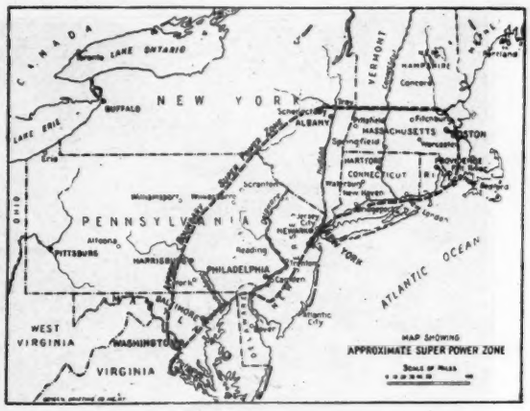
Hydroelectric Plant, Showing Building, Intakes, Dam and Tailrace.

The super-power plan, briefly summarized, provides a means by which a present estimated machine capacity of 17,000,000 hp.—divided 10,000,000 for industrial purposes and 7,000,000 for the railroads—in a region between Boston and Washington and inland from the coast 100 to 150 mi., now operating with a load-factor not exceeding 15%, can be lifted to a load-factor of greater than 50% and possibly to 60%. The value of machine capacity from a utilization standpoint will be increased three to four-fold, and coal resources for the purposes named will be materially conserved. Again, the present plant capacity of 17,000,000 hp. can be replaced by one not greater than 5,500,000 hp., and a vast tonnage of coal can be saved each year. It has been estimated by the advocates of the plant that a

total saving of $300,000,000 per year can be made.

Continuous electrical connection has already been established for over 500,000-kw. of generator capacity in New England. Systems in Pennsylvania and New Jersey are connecting together over 250,000 kw. The Montana Power Co. has 13 hydroelectric plants electrically interconnected on a 100,000-volt bus line, and five systems in Southern Vermont, with 27,500 kw. in installed capacity, are operating successfully together. California is just completing the last link which closes the gap in a far-flung system of transmission lines.

After eight years of unremitting effort the proponents of water-power development succeeded on May 28 in having passed by the United States Senate the much mooted Water-Power Bill. The measure was approved and signed by the President early in June. Application for licenses covering more than 500,000 hp. had already been filed awaiting the organization of the Federal Power Commission. It is estimated that there is potential water resources of 60,000,000 hp. in the United States, of which about 10,000,000 hp. is at present developed. Including the last week in November applications submitted to the Federal Power Commission covered projected developments of about 8,000,000 hp.

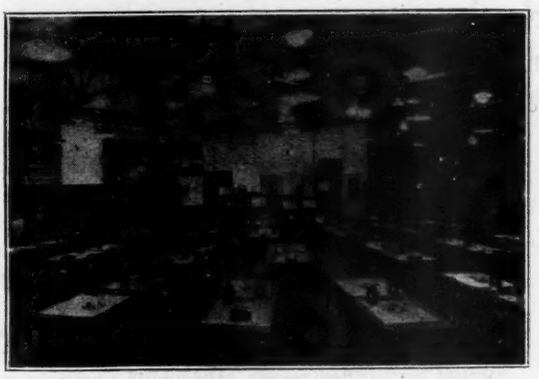



Territory Included in Comprehensive Power-Development Plan.

# Electric Lighting

## Industry Recognizes Necessity of Educating Public to Better Lighting—Industrial Lighting Demonstrations—Progress Made in Residential Field

The situation revealed in the survey of prevailing conditions as to industrial lighting made in the fall of 1919 stimulated an intense activity upon the part of all elements in the industry to raise the level of illumination, resulting in some very considerable sales developments. The perfecting of the foot-candle meter has given to the lighting industry an easily understood device which has assisted greatly in bringing about a better appreciation upon the part of industrial executives of the disadvantage of operating under faulty lighting conditions.



Interior of Lighting Demonstration Room Developed at Nela Park.

Much progress has been made in both industrial and domestic lighting in the avoidance of glare through the use of proper reflectors, the better diffusion of light and the adoption of the new white Mazda lamp with its milky white bulb. There has been an increasing demand for opal glass, or mirrored-metal caps, for gas-filled lamps when employed in the dome-type metal reflectors.

There have been developed several types of combination reflectors seeking to avoid glare, give a reasonable amount of reflected light on the working plane, and at the same time illuminate the area and surfaces above the lighting equipment so as to reduce the sharp cut-off which the solid reflector exaggerates. These new types have not reached that state of perfection where there has been any very great industrial or trade acceptance, and the record of the year is rather negative in this direction.

There has been made, however, a distinct gain in the development of color-matching outfits, but with the exception of a fairly general acceptance of the Mazda daylight lamp, primarily for store and store-window lighting and for certain industries, the production and ultimate utilization have not reached very high figures. The tendency in development is toward some really practical daylight and color-matching units, and the early months of the new year should show some of these perfected and ready for the market.

In street lighting there is not much to report, there having been developed and installed a

Arrangement of Units and Charts to Use in Planning Illumination.

Proper and Improper Methods of Industrial Lighting Demonstrated in Exhibits Made by Central-Station Company.

normal amount of white-way and community-parkway lighting. There has, of course, been more or less discussion of the relative advantages of conduit and parkway system of wiring, with the preponderance of choice favoring the latter system.

Reverting to industrial lighting, it is found that the industrial commissions of several states have adopted industrial lighting codes for factories, mills and other work places, the list of states now including Ohio, Pennsylvania, New Jersey, New York, Wisconsin, Oregon and California.

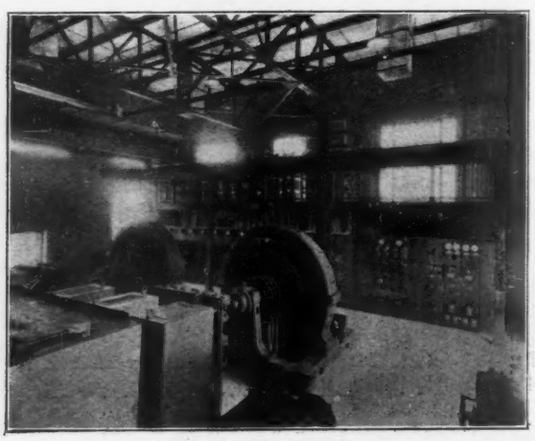
Under the inspiration of the National Electric Light Association a great deal of field work is being done through the use of portable exhibits demonstrating to industrial-plant engineers the advantages of effective lighting.

It is expected that lamp sales for 1920 will surpass the 1919 volume by from 25 to 30%. It is figured that total sales of large tungsten and carbon lamps would amount to approximately 230,000,000 for the year. Of this amount carbon lamps will account for about 15,000,000, leaving 215,000,000 tungsten—vacuum and gas-filled—lamps of the large sizes. Miniature lamps will probably total an output of just over 100,000,000.

# Electric Railways

## Improvements in Automatic Substations and Other Operating Equipment—Railway Electrification Makes Headway—Powerful Locomotives Developed

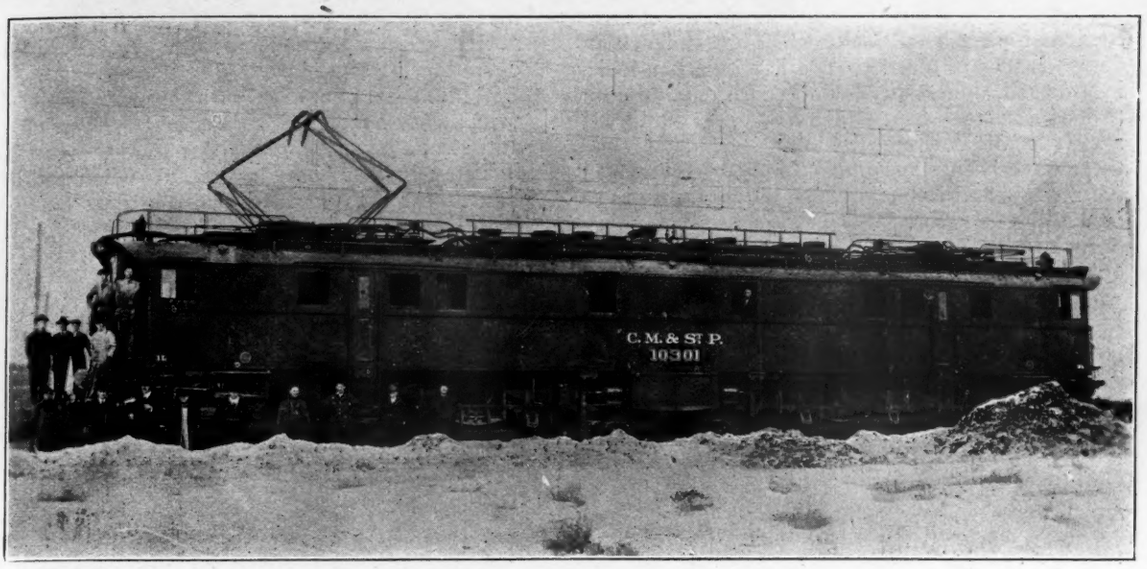
Developments in electric traction and railway electrification, while not spectacular, were on a progressive basis, and the year marked the completion of some important work and the inauguration of actual main-line operation in both passenger and freight divisions by powerful electric locomotives. From a technical standpoint probably the most attention has been given to the development of automatic operation of railway-converter substations and an increased tendency toward their use for heavy service. The recent development of flash barriers for railway machines affords a device of much benefit to automatic substations, and these devices are now included in some cases as a regular part of the equipment. The combination of flash barriers and high-speed circuit-breakers is apparently giving satisfactory protection to railway-converter equipment. Improved types of motor-operating mechanisms for oil circuit-breakers, and reverse-current and other relays capable of accurate calibration have been designed to accommodate conditions surrounding automatic-substation operation.



Automatic Substation for Heavy Street-Railway Service.

In fact, the developments of the year have firmly established automatic control in railway substations for both city and interurban-railway operation. Even where the service requirements are severe and the traffic heavy the success has been apparent, and the adaptation of automatic control to d-c. trunk-line service at 2400 or 3000 volts, as well as more extended use in the strictly industrial field, is a promise for the near future. There are already more than 80 automatic railway substations in use, ranging in capacity from 200 to 3000 kw.

On March 5 electric-train service was inaugurated on the Pacific Coast division of the Chicago, Milwaukee & St. Paul Railway. Electric trains are now in operation from Seattle and Tacoma on Puget Sound to Othello on the east side of the Columbia river, a distance of 207 mi.




Modern Electric Locomotive Being Used in Main-Line Haulage.

There is also 440 mi. of electrified railway in Montana, making a total of 647 mi. thus far electrified. Between the western terminus of the Montana electrified division and Othello there is a stretch of 212 mi. of road still served by steam locomotives. After that portion of the line has been electrified the Milwaukee company will have 860 mi. of road over which passenger and freight trains will be electrically operated.

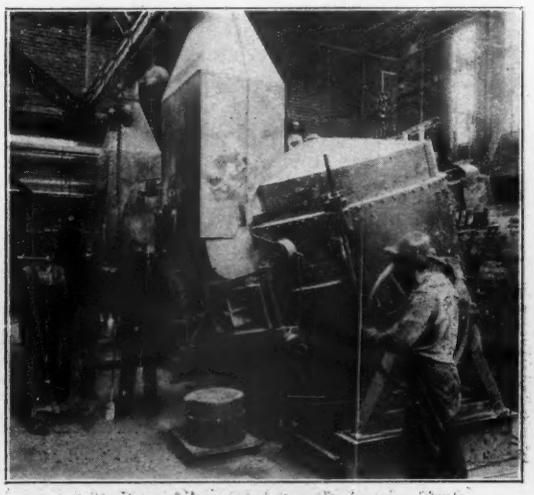
The electric locomotive used in connection with the inauguration of service was built by the General Electric Co. especially for passenger service on the Pacific Coast division. The locomotive is 76 ft. long and weighs 265 tons. It is equipped with 14 axles and 12 d-c. motors. The Westinghouse Electric & Manufacturing Co. has constructed an electric passenger locomotive which has recently been placed in service on the electrified line of the Chicago, Milwaukee & St. Paul Railway, which is claimed to be the largest and most powerful ever built. This locomotive weighs 275 tons and is rated at 4200 hp. for one hour, and 3400 hp. for continuous operation. On full-field connection of the motors the tractive effort is 66,000 lbs. for one hour, and 49,000 lbs. continuously. Four of the armatures of the motors, or two complete motors, are always connected in series across the 3000-volt energy supply so that normally there is never more than 750 volts between the brushes of each commutator.

# Electrochemistry

## Arc-Welding Applications Extensive—Growth of Electric-Furnace Industry Affects Central Stations — Cyanide Production on Commercial Scale

Arc welding has made great strides in industry. The gathering together of scientific data and analysis of this information has occupied the master minds in this development, and the characteristics and performance of the machines now available show the decided advantage of attacking the problem in this way. The principal developments are apparently in electro-percussive types, equipment having been deveolped which successfully welds stock up to 0.5 in. and larger diameters, stored electromagnetic energy replacing the electrostatic energy of the condenser types.

A new type of arc-welding generator has been developed which eliminates external resistors and other regulating devices, the generator delivering at its terminals the voltage required and the current for which the equipment is adjusted. Devices have also been introduced for automatically feeding a wire electrode into the welding arc at the exact rate required to maintain constant electrical conditions in the arc. The tendency in design continues toward the single-arc machine; that is, a separate machine for each operator. Important developments in semi-automatic portable machines are also recorded. The electric furnace is more than ever established as an important part of the steel industry. During the year much attention has been given to the subject of training of furnace operators, as in this direction there



Electric Furnace for Brass Melting.

appears to lie the greatest opportuntiy for improving service, quality and output of electric steel and electric-steel alloys. The tendency in design is toward more automatic regulation, looking toward higher speeds and more definite control of furnace heats and tonnage. The direct-arc type of furnace predominates, and while there have been some unusually good designs in the resistor and induction type the arc appears to be gaining in favor.

In 1910 the United States could claim about 10% of the electric steel furnaces installed in the world. In 1918 the proportion had risen to 36% of the total installed, and, while figures for the past year are not available, it is predicted that owing to the increase which has come naturally and logically in this country and the unsettled conditions which have been obtaining abroad the percentage for 1920 will show a much greater gain than has been recorded heretofore.

There are between 500 and 600 electric steel furnaces installed in the United States, the gross tonnage having grown from 13,000 in 1909 to over 500,000 at the beginning of this year. Owing to many unfavorable conditions it is expected that the output of 1919 will just about be met for the year just past. That the electric furnace is a most important development, so far as its energy requirements are concerned, is indicated by the heavy loads now being carried by central stations for this purpose. One company in the Pittsburgh district is averaging 4,500,000 kw-hrs. per month, and it is estimated that in the Pittsburgh district there will be at an early date a requirement for not less than 300,000 kw. for electric-furnace operations.

While great progress has been made in the development of the electric furnace for electric steel and steel alloys, the growth of the brass-furnace industry has not been slow, and when ultimate figures for the year are available it is expected that they will show that the record of growth made for the past several years has more than been maintained.

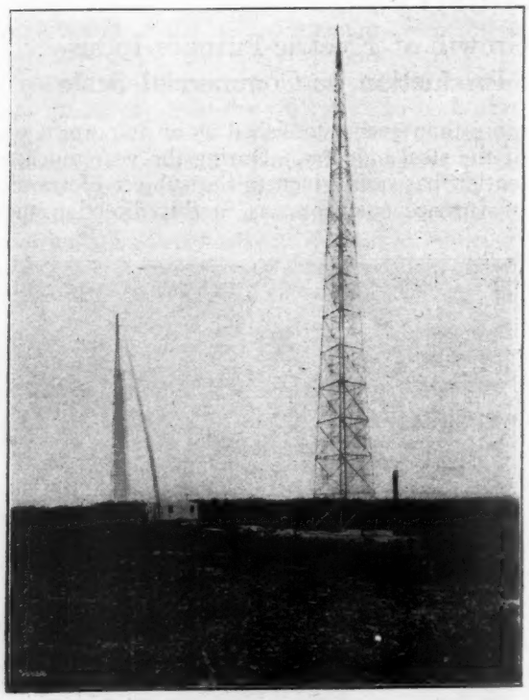
Applications of electrochemistry to industry have been numerous and, in general, maintained in increasing volume. During the year it was announced that the electrochemists of this country had triumphed over foreign competitors by developing a new method of producing cyanide from cyanamid. With the use of a small continuous-type electric furnace there has been produced the equivalent of 4 tons of sodium cyanide per day at the end of three months after beginning plans for the plant. It is stated that the product is of better quality than that produced in Germany.

In electric heating in general progress continues, the use of space-heating resistors growing at an accelerating rate with the demand for both domestic and commercial electric ranges taxing the productive capacity of the leading manufacturers. In industrial installations the electric oven is making rapid strides not only for japanning and enameling, but extending into the foundries as well.

# Telephony and Telegraphy

## Machine Switching to the Fore—Extension of Toll Cable Systems—Important Developments in Radio Communication—Inventions in Telephotography

Much of extension and betterment deferred dring the period of the war, and undertaken to a considerable extent during 1919, was completed during the past year. After exhaustive investigation and long-continued experiments engineers of the Bell telephone system have produced an automatic switchboard which is said to meet satisfactorily the exacting service conditions imposed in both small and large central service. Without deprecating the splendid work of many independent investigators, inventors and manufacturers, it is claimed that until this time there has not been available a system of such universality in application that it could successfully meet the requirements of a complexity met with in city communication needs. Results of trial installations have apparently demonstrated that the new machine-switching system will meet all essential requirements. Work of manufacturing is well advanced and installations are projected for early in 1921.



Towers for Radio-Communication Service.

Toll cable systems have been extended. Work is under way to place the principal cities of Cuba in telephone-cable communication with the people of this country.

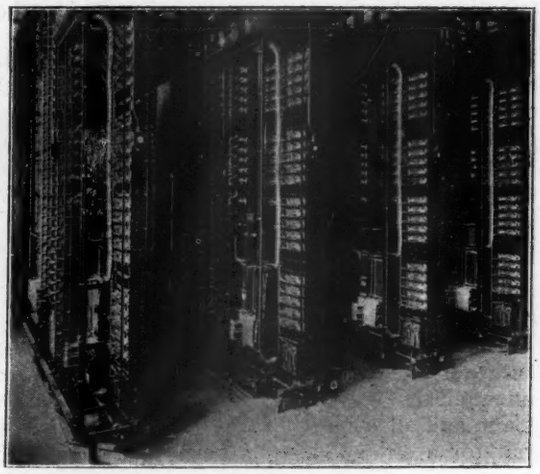
There are approximately 210,000 employes in the associated Bell companies, operating 25,000,000 mi. of wire.

In wireless the developments have been of a commercial rather than of a technical nature. The General Electric Co., which for several years has devoted its laboratories and factories to the development and manufacture of devices essential to the transmission and reception of wireless com-

munications, and the Marconi Wireless Telegraph Co. of America have consolidated their resources in the formation of the Radio Corp. of America. Co-operating in this effort to advance the art of radio communication, the American Telephone & Telegraph Co. has purchased a minority interest in the Radio corporation. Similarly, in Canada, the interests of the Marconi Wireless Telegraph Co. of Canada, Limited, have been merged with the Canadian General Electric Co.

The Westinghouse Electric & Manufacturing Co. has acquired a controlling interest in the International Radio Telegraph Co. and will be interested in both the manufacturing and operating branches of wireless telegraphy and telephony. Ambitious plans have been developed looking to the building of several large stations linking every part of the civilized world.

A new record in radio telephony was made toward the end of the year when communication was established between stations on Catalina Island, off the coast of Southern California, and the steamship *Gloucester*, off Philadelphia. Catalina Island was linked to Los Angeles by radio, Los Angeles to San Francisco, the latter city to New York by telephone, and New York to the *Gloucester* by radio.



General View of Machine-Switching Installation for Automatic Telephones.

Related to the art of wire communication, telephotography, the art of transmitting pictures by wire, takes on new interest just as the year closes by the apparently successful experiments of Edouard Belin of Paris in transmitting photographs between New York and St. Louis, ...

# Future of the Industry

## Electrical Interests Face Biggest Opportunities in History—Every Element Geared to Accomplishment—Practical Co-operation of All Factors Assured —Trade Relationships Believed to Be on Better Basis Than Ever Before

One of the outstanding features of all that has transpired within the electrical industry during the past 12 months is the real tangible evidence that every element in the industry is geared to a big job and eager to embrace every opportunity for real practical co-operation. The proponents of the "Goodwin Plan," carrying the message and example of good-will and mutual respect into every part of the country, have gained friends everywhere and welded influence and interest into a condition of solidity one would not have dared to presume was possible of accomplishment only a few years ago. Today we find manufacturers, jobbers, contractor-dealers and central-station companies vieing with each other to lend a helping hand and assist one with the other in solving individual and mutual problems. We find the manufacturer giving ungrudging acclaim to and acknowledging dependence upon the economic distribution of electrical supplies through the medium of the electrical-supply jobber. We find the electrical-supply jobber assisting the contractor and contractor-dealer to become a better merchant, to realize to a greater advantage the opportunities existing through proper systems of accounting, and establishing of adequate credit relations. We find the central stations discontinuing embarrassing tactics which handicap the local dealer in his merchandising efforts, and we find the contractor and contractor-dealer saying a good word for the central station, and even buying central-station securities.

We find the Society for Electrical Development securing renewed support from the largest utilities and industrials in the country. We find the California Co-operative Development League stronger than ever, with organizations of a similar nature springing up in various other parts of the country. We find the American Institute of Elecrical Engineers celebrating the centennary of the epoch-making discoveries of Oersted, Ampere and Arago in electrical science. We find the engineers devoted to various departments of applied science consolidating their efforts in the Federated American Engineering Societies, and we find the leading minds of the world devoting much thought and superior consideration to various phases of the relationship of engineering societies to public service.

To sum it up, we find the world in every stage of its contemplated progress looking to the engineer, and particularly the electrical engineer and the electrical industry, to bear the burdens, solve the problems and develop the energy that will make it possible for industry to live and continue to prosper.

Reviewing but a few of the things which are to be done immediately, we have ahead of us a tremendous job of bringing up to suitable standards the artificial illumination of millions of homes and hundreds of thousands of industrial plants both large and small. We have the equipping of these plants with all sorts of devices for the motorization of the various industries and for the control and regulation and protection of these motors, and the generation and distribution of energy for the working of these devices. We have the problem of developing greater amounts of energy for the myriad electrical conveniences which are going into the home, with their various

attachments and the necessary networks of distribution and intimate energy supply to make the whole a working unit.

We have thousands of horsepower to be developed for the greater utilization of electrical energy in the electrochemical and electrometallurgical industries. For electric steel furnaces alone the power requirements are tremendous, and the outlook for the immediate future transcends even the magnitude of the opportunity as it exists today.

In the electric-railway field and in the electrification of main-line railways, great as is the present development, a beginning only has been made. This feature of electrical supply in the immediate future is inevitably tied up with the problems of interconnection and its correlary the super-power plant and distribution system. The latter will call for a strengthening of design, an improvement in the simplicity and ruggedness of material and, eventually, an entire change in the theoretical and practical applications as they exist.

The passing of the Water Power Bill and the releasing for development of the potential water resources of the nation bring another problem—that of the utilization of over 50,000,000 potential horsepower, which will mean the opening up of territory hardly inhabited at the present time and the working out of extraordinary mutations in industry and in the vocational habits of a large part of our population.

### Concerted Effort Required to Solve Problems.

All of the foregoing are matters of immediate concern. The various problems are being attacked with vigor, and applications will certainly follow in the near future. In the meantime a great responsibility rests upon every element in the industry to view the problem as a whole and strive earnestly each to do its own particular job to the best of its ability, and leave it to the other elements to do their jobs according to their fitness and equipment. If the electrical industry has been cursed by anything it has been by the aptitude for each of the elements to adopt and seek to perform many functions other than that which by equipment, training and resources it was best qualified to do. Apparently there is a disposition to discontinue this loose spreading of activities and the determination to hew to the line, each to his own task, and through acquiring a greater respect for the importance and significance of a particular job, to develop a higher respect for the special and particular performances of others.

Paramount among the many things which this understanding and assumption of responsibility bring is the necessity for standing back of and assisting in the development of our public utilities. Unless there is forthcoming capital from within and without the industry to finance rehabilitation and extensions, public utilities cannot continue to serve. It is well known that practically every utility is at the end of its resources, so far as station capacity is concerned, and it is a fact that so little in the way of replacement and rehabilitation has been possible for one reason or another for several years that the present station capacity is in danger of breakdown unless it is immediately relieved by extensions and repairs.

If systems of production and distribution break down industry in a large measure must stand still, and people will have to do their daily tasks under exceptional physical and mental handicaps. It is urgently necessary therefore for everyone in the industry to become to the greatest extent possible an exponent of utility development, informed on the necessities of the situation and an individual representative in contact with the uninformed so that the advantage of meeting these necessities promptly may be thoroughly understood.

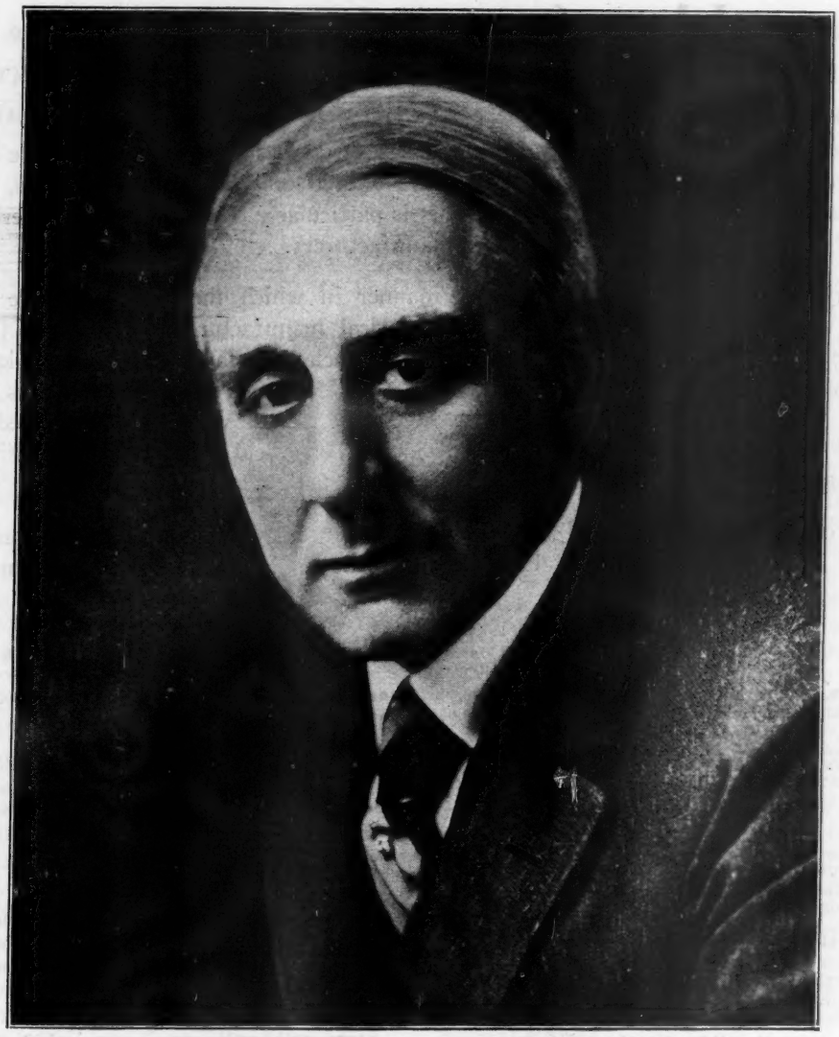
During the last three months a recession in industry has been reflected to some extent in the demand for the products of electrical manufacturers, and this recession has visibly affected the businesses of other elements in the industry. It has been well said that the nation is waiting for the deflation to subside and for the bottom, so far as prices are concerned, to be reached, when there will be an immediate stimulus in the demand for practically everything of a manufactured nature in which the country at large stands greatly in need.

Undoubtedly there will be reductions in the basic prices of many commodities foreign to the electrical industry. Undoubtedly there will be reductions in the cost of materials entering into electrical manufactures and in the cost of many of the components used in the assembly and operation of electrical apparatus. There is little chance, however, of any considerable retrogression in the basic price of electrical goods. In all of the unprecedented advances which have been made in the price of articles of general merchandise it is a fact that there has been practically no general increase in the cost of energy, rates for service, or prices paid for electrical merchandise and electrical apparatus. The basic price of copper, porcelain, insulation and the compounds entering therein are as low now and have been as low for some time as it is reasonable to expect they will go and make it possible to continue their production.

The stocks of manufactured articles, apparatus and devices of stable merchandise are low, and any gains which may be made through reducing costs by improving the efficiency of production will be offset by higher selling costs in building up the market to where it was at the peak of demand a few months ago.

The best opinion of the economists of national reputation is to the effect that there will be a recovery in business within a period of 60 days. Business men are doubtful that the recovery will come about as quickly as that. All, however, are agreed that early in the spring we will be in a comparatively safe position. The electrical industry has suffered least and been the last to feel the effects of world-wide readjustment. It is therefore in the best position through its unimpaired resources to weather the storm, and because of the necessary characteristics of its products will be the first to make the upturn when conditions go back to a normal basis.

Faith in the future, faith in each other, and, particularly, faith in the industry, ever cultivated and adhered to earnestly and steadfastly, will permit us to meet our obligations and responsibilities, and when another year shall have passed by, put us in possession of another 12 months of record achievement.



# Present Attitude of Public Offers Encouragement to Central-Station Industry

By MARTIN J. INSULL
President, National Electric Light Association.

*An important feature of the year is the changed attitude of the public toward utility companies. The restrictions of wartime and those attending the fuel shortage brought the public to an understanding of the vital part that central-station service plays in their daily lives. They have consequently come to a realization of the necessity for supporting local utilities, and this has been shown recently in the purchase of public utility securities by customers. The same tendency will be manifest in liberal treatment of the utilities by regulatory bodies.*

*There is every reason to believe that the large thinking body of the public will from this time forward appreciate that their interests and those of the utilities are mutual in that the success of any community depends so largely on the proper development of the utilities by which it is served. I know of no single feature of the present situation which has greater promise for the future.*

# Estimated Value of Electrical Products Manufactured in 1920

In presenting the accompanying estimate every effort has been made to achieve the maximum degree of accuracy. While the figures are offered only as estimated values, there are some actual figures included in the list. This is particularly true in the fields where the production is controlled by comparatively few manufacturers.

It may be of interest to state briefly the manner in which the estimates were compiled. Inquiries were directed to practically every electrical manufacturer, asking for the actual value of his products, manufactured during 1920. Each manufacturer was also asked to estimate the value of the business done by all manufacturers in his field, based on his own production. Where complete returns were received the actual value was computed. Where it was not possible to obtain complete returns in any one field, the returns received were checked against the average of the estimates for that field.

This opportunity is taken to thank those manufacturers who so kindly co-operated in this work and also the various electrical trade organizations who gave valuable assistance.

| Article. | 1919, Value. | Estimate for 1920 of All Manufacturers. |
|---|---|---|
| **Air washers**, cooling ponds | $ 240,000 | $ 800,000 |
| **Arc lamps** and appurtenances | 480,000 | 550,000 |
| **Auxiliaries, steam**, for electrical installations, such as pumps, condensers, separators, feed-water heaters, injectors, piping, etc. | ..... | ..... |
| **Brackets**, pole-line hardware, etc. | 6,250,000 | 8,000,000 |
| **Bells**, buzzers, push-buttons, call boxes, annunciators | 2,642,000 | 3,500,000 |
| **Carbons** for lamps, batteries, brushes or other electrical purposes | ..... | 11,000,000 |
| **Circuit-breakers** | 6,500,000 | 10,000,000 |
| **Conduits** (underground) and similar material | 1,200,000 | 2,000,000 |
| **Electroplating** and other electrolytic apparatus not elsewhere specified | 2,750,000 | ..... |
| **Electrostatic machines**, induction coils, medical sets | 900,000 | ..... |
| **Elevators**, electric (mechanical only) | 6,000,000 | ..... |
| **Engines**, gas or gasoline or oil, used to drive electrical machinery | 8,000,000 | 8,000,000 |
| **Engines, steam** (reciprocating) used to drive electrical machinery | 4,000,000 | 6,000,000 |
| **Fans**, electrically operated and direct-connected | 8,250,000 | 10,000,000 |
| **Feeder regulators** | 750,000 | ..... |
| **Fire-alarm apparatus**; also burglar alarms, crossing indicators, etc. | 900,000 | 1,400,000 |
| **Fixtures** for electric lighting | 12,560,000 | 18,000,000 |
| **Fuses** | 5,020,000 | 8,000,000 |
| **Generators** | 46,875,000 | 50,000,000 |
| **Glassware**, electrical | ..... | 2,000,000 |
| **Heating** and cooking apparatus, electrical | 9,030,000 | 16,000,000 |
| **Incandescent lamps** (carbon or metal filaments) | 67,500,000 | 70,000,000 |
| **Instruments** for measurement and meters, of all kinds; also ground detectors, scientific and laboratory apparatus, photometers, Leyden jars, X-ray outfits, etc. | 10,571,000 | 10,000,000 |
| **Insulating material**, fiber tape, etc. | 8,175,000 | 10,000,000 |
| **Insulators** (glass and porcelain) | 10,500,000 | 18,000,000 |
| **Interior wiring supplies**, as tubing, interior conduit, molding, junction boxes, rosettes, outlet boxes, etc. | 10,500,000 | 22,000,000 |
| **Lightning arresters** | 2,000,000 | 2,500,000 |
| **Locomotives**, electric | 4,500,000 | 7,000,000 |
| **Mercury-vapor lamps** | ..... | 1,500,000 |
| **Motors**, including parts of machines, boosters, balancers, rotary converters, motor-generators, etc., and all motor applications | 103,500,000 | 250,000,000 |
| **Poles and towers**, cross-arms, etc. | 6,433,000 | 8,000,000 |
| **Primary batteries** | 6,000,000 | 6,500,000 |
| **Railway supplies**, electric, such as trolleys and other contact devices, strain insulators, cross-overs, rail-bonds, etc. | 7,500,000 | ..... |
| **Rheostats**, car controllers, motor starters, etc. | 6,180,000 | ..... |
| **Shafting**, pulleys, clutches, etc., used in electrical generating plants | 2,000,000 | ..... |
| **Signs**, electric | 4,002,000 | ..... |
| **Sockets**, switches, cutouts | 10,008,000 | 20,000,000 |
| **Steam turbines**, used to drive electric machinery | 14,250,000 | 15,000,000 |
| **Stokers** | 8,000,000 | 10,000,000 |
| **Storage batteries**, including used in automobiles | 62,500,000 | 40,000,000 |
| **Street-lighting equipment** | ..... | 2,000,000 |
| **Switches**, signals and attachments | 7,700,000 | 10,000,000 |
| **Telegraph instruments** and apparatus | 1,750,000 | 1,000,000 |
| **Telephones**, telephone switchboards and distinctively telegraphic apparatus | 23,500,000 | 30,000,000 |
| **Transformers**, stationary | 21,500,000 | 25,000,000 |
| **Vacuum cleaners** | 9,500,000 | 40,000,000 |
| **Waterwheels**, used to drive electrical machinery | 4,000,000 | 5,000,000 |
| **Welding apparatus**, electric | 1,250,000 | 1,500,000 |
| **Wire and cables**, insulated | 90,000,000 | 100,000,000 |
| **Wire**, weatherproof | 20,000,000 | 28,000,000 |
| **Wire**, all other electrical | 25,000,000 | 40,000,000 |
| **Wireless apparatus** | 2,000,000 | 1,000,000 |
| **Washing machines** | ..... | 100,000,000 |

# The Coming Year Should Stabilize Merchandising

## Past and Present Conditions in Retail Branch of Electrical Industry Indicate Beneficial Results to Accrue from Readjustment Period and Through Valuable Lessons About to Be Learned

By WILLIAM L. GOODWIN

In the retail merchandising branch of the electrical industry, the year just closing has been one of prosperity and commercial success. It has been a year of advancement along many lines because the retail electrical merchant has been more alive to his opportunities than ever before. There are three reasons for this prosperity and advancement in electrical retailing.

W. L. Goodwin.

First is the natural growth of demand for electrical products which has been fostered and developed through publicity channels by the manufacturers, central-station companies, jobbers and other large distributors, and by the trade press and daily newspapers. This has interested and educated the public in the utility, comfort and convenience obtainable by the use of this great modern servant through the various practical appliances and applications now made possible by the productive genius of those engaged in the engineering and manufacturing departments of the electrical industry.

Secondly, the retail merchant has endeavored to meet this public demand in the same progressive spirit; and, as a result, this branch of the industry is well on the high road to future financial success with ever-expanding ideals of the true merchandising spirit. High-grade stores have been developed, great improvement has been noted in the appearance, practice and methods of the older concerns, and the spirit of real service to the public has flourished.

And third, co-operation along all lines in all branches has been a keynote of the industry, and its practical application has brought to every one concerned a feeling of satisfaction and a growth of confidence in himself, in his fellows and in his business.

### All Branches of Electrical Industry Dependent on Each Other.

This spirit of co-operation has grown, but as yet has not reached full growth, nor are its great possibilities as yet properly appreciated, especially throughout the electrical industry. Yet, in the electrical field more than in any other, existing and growing industrial co-operation is required and the rewards obtainable are so apparent that lack of co-operation is inexcusable. Practical co-operation from the broadest and most catholic standpoint, and without the thought of the personal equation, should be the aim of every man in the industry.

Realization of how interdependent we all are on each other needs but a moment's thought along the right line. How far could the manufacturers go in production in any line if the central station companies were not created and developed?

The genius, faith and courage, coupled with the engineering and financial ability and belief that is essential in the man or men who start out to create and build up a central station for the sole purpose of public service is seldom appreciated. The fate of the whole enterprise, no matter how well built or skilfully manager, has been up to the present time dependent in a very great measure upon the force and direction of public whims. One great fault of mankind is its readiness to pass judgment as to the quantity and quality of service which it expects from others without due consideration of what it should give in return, and this is especially true today of the attitude of the public toward central-station companies and other public utilities.

What part do we who are directly connected with the industry take in the forming and enlightenment of public opinion? Do we loyally and intelligently uphold a real picture of the basic facts which are behind the efforts of central-station companies to efficiently serve public interest? Do we point out that the general public must appreciate fully the service given and encourage further effort of development by not only a generous use of the light and power now furnished but by the exercise of a spirit of justice and equity in the formation of the laws governing its relationship with such companies? Further, do we emphasize the fact that the public must display a readiness to show its belief in the usefulness, demand for and security of these enter-

prises, by investing its surplus funds in the stocks and securities of this branch of the electrical industry without which there cannot grow and develop the necessary plants and equipment with skilled and trained servants for further extensions of this modern, energetic and willing servant?

At no time in our country's history has the need for real co-operative effort on the part of all those seeking to serve the best interests of their communities, their state or the nation as a whole whether, it be as manufacturers, as merchants, as investors, or simply as one of the army of workers who are seeking to play a man's part in the great game of life, than there is today.

### New Year Holds Promise of Stabilized Merchandising Conditions.

Contractor-dealers should have great faith in the year to come. Fundamental conditions are sound. The conditions through which we are now passing are more in line with what normal business should be. They seem unusual because of comparison with the past six years during which we were operating under abnormal conditions. As we pass through the process of readjustment we will come to a realization that it has been best for our ultimate good. We will throw off some of our bad habits of inefficiency and carelessness and we will forget the lesson of the last six years wherein profit was the sole thought in business administration.

We will learn the lesson of economy, and our studies in business administration will be along this line. We will establish permanent and effective channels of distribution. We will constantly strive for an improvement in our product and develop along lines which will stabilize our products and our methods.

We will give much thought to the question of standardization, and, while not permitting ourselves to go to the point of retarding progress in the development and art of our industry, we will think of standardization from the ultimate consumer's standpoint. Voltages, frequencies, currents, receptacles and means of contact—those terms with which the large consuming public comes in daily contact—with us will be the things we will think about, and in those fields our efforts toward standardization will be productive of much good because they will mean popularization of our product.

### New Lessons to Be Learned to Further Electrical Interests.

We will give more attention to service—that indefinable, misunderstood and often abused word. As we learn to speak a language understandable to the great public we will set up a measure of service and this measure will bring forth its true reward. We will be able to present and explain a kind of street-car service that merits a fare beyond the nickel of the past. We will find a public responsive to increased fares as we learn ways of explaining service values.

We will learn ways of explaining to the public the great service the utility company gives in the supply of energy, and as the public grasps the value of service it will be responsible to rates commensurate to the cost of rendering such service; and they will provide the necessary funds for maintenance and development. But we cannot learn the lesson of service and we cannot teach it to the public in technical terms. We must learn the lesson of speaking in the layman's tongue and, before we can do this we must know the value of service within our industry and find a common ground upon which we can all do the most effective work.

### Service of Different Branches of Industry Has Great Value.

There is much misunderstanding as to the value of service rendered within the industry and by and between the several group functions. In some manner we will determine the value of this service and the nature of its function, and the measure we will set up will very clearly indicate our future course.

The service which the jobber, the contractor-dealer, the utility company and the manufacturer renders to the industry, each has a very definite value, and as we learn this value and recognize it, the efficiency and effectiveness of our effort will be rewarded. We will have removed much of the cause of misunderstandings, and we will enable all in the industry to concentrate their energy on service to the buying public.

With the advent of a new era and a new administration comes the necessity for sinking all differences, for taking hold of our individual parts and forgetting the mistakes and errors that may have crept in for any cause or reason. The time is now here and the opportunity is offered as never before for us all to take advantage of this co-operative spirit and apply the highest standard of ethical principles to our viewpoints and conduct in private and business life. The electrical industry, as a whole, should, can, and it is believed, will lead in this modern forward movement to help make our country, its institutions, its government and its industries the models they should be of a free, happy, economical and industrious people.

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## CIVIL SERVICE EXAMINATION FOR FUEL ENGINEERS.

The United States Civil Service Commission has announced an open competitive examination for fuel engineer, assistant fuel engineer and junior fuel engineer, applications for which will close Feb. 1. The duties of fuel engineer will be to conduct laboratory and field fuel investigations in combustion, furnace design, smoke prevention, heat transmission, the efficiency of fuel-using devices, and to write reports thereon. Appointees to the position of assistant fuel engineer will be required to assist in tests of boiler and other furnaces, of auxiliary equipment affecting efficiency in the use of fuels, investigation of fuel-burning methods and machinery, inspecting and sampling fuel and compilation of data. Applicants for the position of junior fuel engineer must have graduated in mechanical engineering from a college or university of recognized standing. Those desiring to make application should write to the commission, Washington, D. C., asking for form 2118 and mentioning the title of the examination desired.

# Progress in the Central-Station Industry

## Electric Light and Power Companies Ready to Meet Readjustment Conditions—Customer Ownership to Influence Good-Will Toward Utilities—Building Operations Will Demand Extensions

By M. H. AYLESWORTH

*Executive Manager, National Electric Light Association.*

The year 1921 will go down in history as an electrical year. The readjustment period which we have looked for is upon us, and the entire problem should be solved within the new year. The electric light and power companies are fully alive to the situation and are ready to meet the problems which must be solved in the interests of the consuming public. All branches of the electrical industry recognize their responsibilities, and I believe for the first time the public is awake to the importance of the electric light and power company to the community and the state and the nation as a whole.

M. H. Aylesworth.

The central-station business is basicly sound and its growth certain. The demand for electric light and power is still much greater than the available supply. The rate of charge for electricity, when considered with the service rendered, gives more to the people for their money than perhaps any other commodity. The public has at last come to a true appreciation of the value of electric service and is beginning to consider qualities in this service which have heretofore been obscure. The service is instantaneous and continuous, and plays a part in domestic and industrial life which ten years ago was unthought of except by those men in the industry who are constantly studying these problems far in advance of a period when they become commercially practicable.

### Good-Will and Co-operation to Be Secured by Customer Ownership.

There are more than 1,500,000 owners of securities of electric light and power companies in the United States, and during the year 1921 there should be added at least 500,000 owners of these securities. This means, of course, that the public has awakened to the basic soundness of this industry, and means also that the electric light and power companies will have 2,000,000 friends in the United States in 1921, who will make it their business to see that the message of good-will and co-operation of the electric light and power company is carried to the doorsteps of their neighbors in their own and other communities. The electrical industry may be particularly proud of the fact that manufacturers, contractor-dealers, jobbers and electric light and power companies are working in harmony, and the result will be reflected in the service rendered to the people and in the growth of the entire industry accordingly.

It has been estimated that there are 14,000,000 unwired houses in this country and that at least 8,000,000 are prospective customers. The farmer has awakened to the value of electric service, and in all sections of the country we find the farmer inquiring for facilities, not for lighting alone but for power, which will to a large extent solve the labor problem on the farm.

The 27,000,000 depositors of the 29,000 banks of the country have just come to the realization that in excess of $1,700,000,000 of the assets of these banks is invested in public utility securities and that there is an average of $63 for each depositor invested in these securities. Early in 1920 it was reported that there were 53,221,457 life-insurance policies in force in this country and that more than $300,000,000 of the assets of insurance companies are invested in electric light and power securities. Therefore every beneficiary under these 53,221,457 insurance policies, or heir to an estate which is a beneficiary under one of these policies, is interested financially in the worth of the securities and the success of our electric light and power companies.

More than 500,000 homes must be built to relieve the housing shortage and 150,000 industries will require electric service during 1921. The constant demand for increased service will require hundreds of millions of dollars for additional capacity and extensions of electric light and power companies. Already the investing public has turned from the debauch of wild spending and speculative investing, and the trend is toward sound investment. If the investing public can be convinced that the general public, represented by the regulator, both state and municipal, is now ready to treat the electric light and

power company with a spirit of co-operation, then I prophesy that finances will be immediately forthcoming.

The great work before the industry for the year 1921 is to "turn on the light" in every state in the union with a national program. I do not refer to a great campaign of serving the public, because it is admitted that central-station companies have served the nation with practical efficiency. Public information, advertising, acquainting the public by word of mouth with the elements of this business which the public can understand, tied in with an honest and intelligent message from the industry to the consuming public through the press, the magazines, consumers' bills, and before every representative body of taxpayers and businessmen willing to listen to a four-minute talk on the industry, will, within a remarkably short period bring home to our thinking people—and most people do think when informed—that the public utility is the people's business, and through regulation and wide public ownership is producing for the consuming public a truly efficient service at low, reasonable rates under practical management.

## BETTER BUSINESS PROSPECTS ARE PROMISED FOR 1921.

**Decline in Money Market Forecasted by Financial Diagnostician Who Predicts Gradual Drop in Prices to Pre-War Basis Soon.**

Perhaps the best indication of the prospects for 1921 is the condition of the money market, as discussed recently by John Moody before the Board of Trade of the city of Toronto. Mr. Moody predicted that the United States would enter the year 1921 with the prospect of definitely easier money. He stated with every assurance that commercial paper would drop from 8% to 6%, and call money will drop to 4% by May, and perhaps even to 3% or 3.5%.

Regarding the trend of prices Mr. Moody gave it as his opinion that during the next ten years we are likely to have a tendency towards lower commodity prices, but he cautioned his hearers that we have climbed a long way since 1914, and that it is just as far down as it was up. In consequence, he thought the deflation period many extend over some years. There did not appear to be any doubt in his mind, however, that eventually we should reach the same price level as obtained previous to the world war. In expressing this viewpoint Mr. Moody simply affirmed what students of past history have already pointed out, namely, that every great war has been accompanied by a rapid and very marked inflation of prices and followed by a slower deflation to a point almost identical with that from which the rise took place. For example, he cited the index numbers of wholesale commodity prices in the United States over the period affected by the Civil War. In 1860 the index number stood around 77, and this had increased in 1866 to 190. A sharp decline is noted then to 120 by the end of 1871, and finally to 70 in 1878. In this case it required a period of 12 years before prices regained their former level.

It is more than likely that in the year 1866 there were those who predicted that future prices would continue at a higher level, just as they are predicting today. The history of the wars of the past, however, have never shown this to be the case, and it seems a natural conclusion that in from 10 to 12 years, if not before that time, the average prices of stable commodities will have dropped to the same index number from which they began to move up in 1914.

One factor that has to be considered, however, in making comparisons with the past is that the much more complete system of communication and transportation of modern times is likely to accelerate the rate of deflation. While no one believes or expects that the old prices will be reached again in the immediate future it is still possible that we may divide the deflation period following previous wars by two and count on standing on rock bottom again in five to six years after the signing of the armistice; that is, in three to four years from the present time.

## BUREAU OF STANDARDS' ACTIVITIES OUTLINED IN REPORT.

The annual report of the director of the Bureau of Standards states that the total number of tests conducted during the year for the United States government was 72,398, and the tests conducted for the public numbered 34,501. During the year the bureau's staff comprised 381 statutory employes and 600 engaged in research and investigations specially authorized by Congress. The work in connection with electrolysis and gas engineering has been actively prosecuted and has resulted in very large savings to numerous municipalities. The work of the section devoted to the testing of internal-combustion engines has been considerably broadened during the year and now includes besides work with aircraft engines various work in connection with automobiles and trucks, which is of great value to manufacturers and users of automobiles.

The results of the bureau's activities during the year are partly shown in the 106 new publications which have been issued, these comprising 50 scientific papers giving results of new scientific researches, 37 technologic papers dealing with practical applications of science in industrial fields and engineering, 16 circulars containing important compiled technical data of special use to the industries, especially to the scientific and industrial laboratories, and three miscellaneous publications. Current investigations are described in a mimeographed circular known as the *Technical News Bulletin* which is issued monthly.

## NEW ENGLAND DIVISION, N. E. L. A., PRESENTS PRIZES.

The New England Geographic Division of the National Electric Light Association held a good-fellowship dinner Dec. 17 at the Edison Service buildings, Boston. M. H. Aylesworth, executive manager of the N. E. L. A., presented prizes for various papers setting forth the advantages of membership in the association. The gathering was featured with addresses by Bowen Tufts, president of the New England Geographic Division, L. L. Elden, G. M. Guilford, C. L. Edgar, F. J. Allen, H. T. Sands and others.

# Effect of Business Conditions on Central Stations

## Readjustment to Permit Operating Savings—Rate Increases Aid in Building Up Reserves—Reduced Income in Some Localities Considered Temporary — Financing Difficulties to Be Relieved

By CHESTER COREY

*Vice-President, Harris Trust & Savings Bank, Chicago.*

The unavoidable application of the laws of supply and demand has caused a decline in commodity prices which will enable the public utilities to operate at somewhat lower costs and to make necessary extensions and additions in 1921 with relatively smaller expenditures than have been possible for some time past. The slowing down of commercial activity, which is particularly severe in some of the manufacturing centers devoted to a single industry or to closely allied industries, has resulted in a slight falling off in the kilowatt-hour output of some of the central-station companies. These conditions very naturally suggest consideration of the effects upon the business and credit of the central-station companies caused by the general, commercial and financial readjustments which are now under way.

The items of fuel, labor and taxes represent a large part of the operating expenses of the central stations which generate with steam. Coal is quoted at lower prices, but in many cases coal piles built up at high prices will have to be worked off, and, furthermore, the increase in freight rates granted to the railroads, seems to preclude the possibility of a return to the old-time prices for coal. There will probably be some saving in labor through the increasing efficiency of labor, and to some extent by reduction in wages, but the pay of central-station employes was not increased in any such way as was that of railroad employes or men in the building trades. Taxes are very high and nobody has the courage to predict immediate savings in that direction.

### Necessary to Build Up Reserves for Depreciation and Contingencies.

The central-station companies have put up a brave front during the last two or three years, but no one can truthfully claim that they have been "making money," and while their position has been infinitely better than that of the electric railways it has been impossible in many cases to fully provide [illegible] reserves out of current earnings. It has also been necessary to follow a hand-to-mouth policy in connection with construction expenditures, and many expenditures have been postponed. With the rate increases which have been granted and an easing up in operating costs, the central-station companies should be able to build up their reserves for depreciation and various contingencies, and write off all items of deferred expenses which in some cases it has been necessary to set up on their books.

With but few exceptions the public bodies with regulatory powers have realized the necessity for increasing the rates of the central-station companies, and there is every reason to suppose that they will also realize the necessity of holding present rates, or in some cases even increasing them, until the companies have built up their reserves and have established themselves upon a thoroughly sound financial basis. Unless this is done it will not be possible for the central-station companies to finance the extensions of their generating, transmitting and distributing plants, which are so necessary if the general development of the country is to proceed with normal rapidity.

### Some Companies Affected by Decrease in Manufacturing Operations.

While time has not been available to collect figures from a great number of the central-station companies, it has been possible to obtain up-to-date figures of both kilowatt-hour output and earnings from some of the largest central-station companies operating in sections of the country which can be used as typical of present-day conditions. The business of the central-station companies operating in agricultural sections and in districts with a great variety of business activities show substantial increase in both kilowatt-hour output and gross earnings for November, 1920, as compared with the corresponding month of the year before. In most cases earnings have increased more rapidly than has output because during the interval rate increases have become effective.

In order to know the worst, figures have been obtained from certain districts depending very largely for their prosperity upon the manufacture of automobiles, rubber tires and silk goods. From these districts, which produced over $3,000,000 of electric earnings in the month of November, 1920, the kilowatt-hour output was 12.4% less than it was in 1919, although the increase in gross earnings from the sale of energy was 20.75% greater in November, 1920, than in the corresponding month of 1919. Other districts depending largely upon the textile and boot and shoe industries, and including one large city indirectly affected by cotton market conditions, showed a decrease of kilowatt-hour output in October, 1920, of about 10% as compared with the output in October, 1919. Earnings figures were not available from these districts.

Insofar as it has been possible to obtain their views, it is the unanimous opinion of the execu-

tives of the central-station companies that decreases in output are temporary and unimportant, and that the companies are so far behind in meeting the demands that have been made upon them, that if one customer decreases his demand it is only a question of supplying some other customer who is eager and anxious to be supplied with electric service.

The credit of a public utility depends upon its cash position and the relation of its earnings statement to its financial structure. If a property is over-bonded, its credit position will be poor until the fundamental weakness is corrected. Assuming, however, a sound financial structure, there seems to be no reason to doubt but that the central-station companies will have their credit supported by the rate regulating bodies, and, if so, the companies may reasonably expect to have funds made available to them for necessary extensions and additions.

### Present Tension in Financial Matters to Be Relieved.

At the moment money is uncomfortably tight and "easy money," if anybody knows what that means, is not in sight. Nevertheless there is every reason to believe that there will be an easing up of the present tension in connection with financial matters, which will make it possible for the central-station companies to finance their bond issues through the usual channels, although in order to do this it will also be necessary for them to do a considerable amount of junior financing by selling preferred or common stock to the great number of small investors living in the territory served by the respective companies. Financial obligations should be undertaken with great conservatism and the principal duty of central-station executives at the present time is to use all their efforts to strengthen their financial structures.

While the holders of the stocks of public utilities are not guaranteed definite returns, they should be assured fair and generous treatment, and if this is accorded them capital expenditures can be financed, and public interest will be served. The common sense of the executives of the public utilities and the control of the commissions will insure the public against the payment of unduly large dividends even if earnings above operating costs and taxes should largely increase. Substantial amounts of earnings must be devoted to the building up of reserves which have been neglected or even depleted, and after this has been accomplished any proper adjustments in rates can be made to meet then existing conditions.

## USE OF PULVERIZED COAL GROWING IN FAVOR.

**Pennsylvania Coal Mine First to Use This Form of Boiler Fuel Successfully—Foreign Countries Interested in Subject.**

In commenting on a recent editorial which appeared in Electrical Review on the subject of "The Use of Pulverized Coal Making Steady Progress," F. A. Scheffler, manager of the power department, Fuller Engineering Co., Allentown, Pa., states: "It does not seem such a long time since several gentlemen accompanied me on a trip to a coal mine in Pennsylvania where the first boiler to be fired successfully with pulverized anthracite coal was in operation. Since that time—practically two years ago—this particular boiler has been running almost constantly day and night supplying steam to operate the coal mines, except when it was shut down for cleaning purposes. The owners have decided to put up a 10,000-kw. plant in the same vicinity which will use some of the culm bank observed on the trip, of which there are at least 2,000,000 tons lying around idle.

"We have received the order for the necessary pulverizing machinery to make a beginning in this new plant and this will consist at present of four or five Fuller pulverizers, each of which will have a capacity in anthracite coal of about three tons an hour, or 12 to 15 tons combined capacity per hour.

"Furthermore, the growth of pulverized coal as applied to boilers throughout this country is indicated by information compiled by us recently, and we have found that in the last year and a half there is in operation and under construction about 70,000 developed boiler hp. This growth is really more rapid than the most optimistic could hope would be the case. The interest aroused throughout the United States, and all over the world in fact, is remarkable and this country has been the Mecca for engineers and commissions sent over here by England, France, Belgium, Sweden, Italy, Spain, Holland, India, China, Japan, Australia, Canada and other countries for the express purpose of getting all the data they could here with a view of utilizing available coals, good, bad and indifferent, which are obtainable in those countries and which they realize can be used to far better advantage in pulverized form than when burned in any other way."

## EDISONIANS ENTERTAIN CHILDREN AT CHRISTMAS PARTY.

The Edison Club entertained the Commonwealth Edison Co.'s employes and their families at a Christmas party held at Medinah Temple, Chicago, Dec. 21 and 22. It was estimated that at least 1500 children were present each evening to enjoy the circus "stunts," greet Santa Claus and receive gifts. While the party was given primarily for the children, the older Edisonians in attendance derived as much pleasure from the proceedings as the youngsters. A feature of the celebration was a large Christmas tree illuminated by colored electric lamps.

## 60,000-HP. UNIT PLACED IN OPERATION IN PITTSBURGH.

The Duquesne Light Co., Pittsburgh, placed the first of its 60,000-hp. turbogenerators to be installed at its new Colfax plant in service on Dec. 18. A special occasion was made of the event, with luncheon given to about 125 leading financiers, engineers and city officials. President Arthur Thompson announced at the gathering that a duplicate unit of the same size is now being installed at the station and that this machine will be ready for operation in the spring. The ultimate capacity of the plant will be about 480,000 hp.

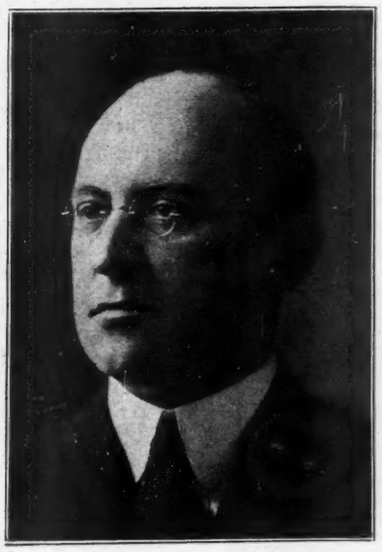
# Financing Electrical Development in the West

## Progress of Customer Ownership of Central-Station Companies Significant of Knowledge of Public that Development of Electrical Resources Is Economic Necessity — California Making Headway

By R. H. BALLARD

*Vice-President and General Manager, Southern California Edison Co., Los Angeles.*

When the equity money requisite in financing our electrical utilities is forthcoming, as it logically should be, through local popular underwritings of the stock offerings, then the major sources of money for new enterprise are in turn available and the question of financing becomes practically automatic in its solution.



R. H. Ballard.

The ideal condition under which a public utility may operate approaches in almost exact ratio to the proportion of its equity which is owned by those who consume its product. This, if carried to its most logical conclusion, would place the ownership and control of the company in the hands of those who depend upon its service and who have an interest in it as an instrumentality in the development of their lands, the growth in population of their towns and cities, and the expansion of their own businesses. It stimulates the self-interest thought of community expansion and individual profit, and makes it possible for the operating company to finance 25% of its development by the sale of junior securities to its patrons and then go into the money markets of the world and borrow the remaining 75% on bonds and mortgages backed by an earning power two to one to that of the bond interest, and made intrinsically stable through a loyal public sentiment and further safeguarded by state regulation, which scientifically fixes rates, eliminates profiteering and precludes destructive paralleling and ruinous competition.

This form of public ownership has been demonstrated to be eminently successful; that is, ownership by the public at large in securities of its own regulated utility companies, which not only retains the ownership of the properties locally but insures to the enterprise the trained experience of those qualified to conduct the business as contrasted with the old and now practically defunct theory of public ownership through taxation, by which the control and operation of the properties was generally in the hands of politicians.

The new financing of the electrical utilities of today is unmistakably significant of an ever-growing knowledge on the part of the American people that the development of the nation's electrical resources is a practical and economic necessity which must progress and be sustained on a scale commensurate with its vast potentialities. In this great mechanical age the all consuming processes have seriously depleted the reserves of timber and mineral fuels. There is but one alternative, which is the utilization of nature's copious and replenishing water sources. Electricity is unalterably destined as the universal prime mover of all industry, agriculture and transportation, and the question of adequately financing the development is so comprehensive in scope as to require enthusiastic and patriotic co-operation of the public at large. If the present generation is to see the intensive electrification of the American continent, and to enjoy its bounties it can only do so by becoming a participant in this great constructive work and a profit-sharer in the inevitable increase in production to follow.

We of California believe that upon our state, with its unique climatic conditions, wonderful soil and hydroelectric resources, must fall the heaviest quota of the burden of production to keep the nation abreast with the requirements of its own population and to hold its place in exportation and world's commerce. Five hundred million dollars will be required in California within the next ten years for new power development. Based upon the reports of the several companies operating in this state, the California Railroad Commission finds that this large sum of money will be needed for producing and distributing 1,750,000 hp. of additional hydroelectric energy. The financing of electric public utilities during the past year or two has been difficult because of the great competition in the money markets with large industrial offerings and public issues such as offerings of foreign markets. Development, however, has gone forward in California to the extent that over 250,000 hp. additional hydroelectric energy will be brought

into operation during the year 1921. Contrasted with the recent acute shortage of power this result speaks for itself in the way of justification.

It has become generally known in California that with an adequate development of hydroelectric plants the state will go ahead and prosper along progressive lines, and without this the state will remain practically at a standstill. The people are now alive to the necessity for this development and are not only evincing great interest in local financing by consumer participation in the junior securities, but a very reasonable attitude and disposition with respect to appropriate rate adjustment to sustain the companies in a sound financial condition and enable them to make the necessary fiscal showings as to total earnings, to meet the requirements and provide the necessary protective reserves and surplus.

## OPERATING RETAIL STORES DURING RECONSTRUCTION PERIOD.

**Ultimate Success and Stability of Merchandising Business Must Depend the Coming Year Upon Conservatism and Sane Reasoning.**

At a recent congress of retail merchants in Chicago, E. J. Hested, a dealer of Fairbury, Neb., talked on the subject, "How to Operate a Store During the Reconstruction Period." Much of benefit to every electrical contractor-dealer was contained in the discussion.

"The period of reconstruction will teach us that now is the time to reconstruct our principles, our habits, our methods, our store, our business and ourselves," said Mr. Hested. "The balloon of prosperity has gone up and it has taken with it the wise and the foolish, the competent and the incompetent, the plunger and the conservative, the slacker and the toiler. They have all made money and they have all accumulated wealth, but now the balloon is too heavy and it has got to come down, and unless you remove the slacker, the plunger and the speculator, it is going to drop; and unless we reconstruct ourselves and our methods, we are going to come down like sandbags.

"With systematic management a business can be operated just as well during a down market as it can on an up market. Some people think that all we know is a low price level. Let's squeeze the water out of these prices; let them come down just as low as they will; let them seek the lowest level possible. The lowest level isn't welcome now.

"These prices that are coming down are going to meet old demands that are coming up, and they are going to get higher and they will never come to the low level at which they have been, but they will reach a more conservative level. They are going higher than they are right now. The price tendencies at the present time are down but they do not go down gradually in the manner in which they come up; they go down like a sawtooth—down and up, down and up. As people lose confidence in one another, they slip down a notch, and then the demand increases and they go up a notch. If I were loaded on any amount of merchandise at this time I would try to crawl down. I would not want to jump because every time you jump the other fellow loses confidence in you. Follow the prices down legitimately, but don't lose your head.

"Store management will not be different than in previous years if we operate the store the same as we did when corn was 25 cents a bushel and when calico sold at 5 cents a yard. You were watching your labor then and you had your fingers on the pulse of your business. If you operate your store now as you did then, that is all that will be necessary."

## POWER STATION BUILT TO SUPPLY SIMPLON TUNNEL.

Up to the present time the Simplon Tunnel railway has been run by the two stations originally erected to supply power for the construction work of the line, but more power is now required than these plants can supply. At one end of the tunnel power could be obtained from the Cairasca station of the Dynamo Societa in Milan; at the other end it is proposed to erect a new power station, an extension of an existing station at Brig, which entails the construction of a new canal, sluices and reservoirs and a new pressure main. According to plans now made the reservoir will have a capacity of 280,000 cu. ft., with an area of 20,000 sq. ft. and an average depth of 14 ft. This reservoir is partly excavated and partly supported on masonry arches, and at one end the walls are of concrete. A long-distance electric water gauge in the engine house gives the level of the reservoir water.

The three turbines are each of 3500-hp. capacity with a net head of 142 ft. and run at 500 r.p.m. The rotors are 2 ft. 10.5 ins. in diameter, and the rotating blades have spring-controlled hinged lips to prevent the risk of breakage by foreign bodies passing through the turbine. Suction pipes are fitted below the turbines, the suction head being 19 ft. 6 ins. and the pipes taper from 2 ft. 11 ins. to 3 ft. 11 ins. internal diameter. Forced lubrication is provided for at a pressure of 150 lbs. per sq. in. The governors will allow a maximum speed variation of 6%, and built-up segmental flywheels are provided. The generators, each of 2700-kv-a. capacity, are capable of carrying an overload of 3400 kv-a. for a short time, and work at 3300 volts and 16 cycles.

Power for lighting is provided by means of two converting sets at 4000 volts and 50 cycles, each set being rated at 210 hp.

## CALIFORNIA COMMISSION APPROVES PIT RIVER PROJECT.

The Railroad Commission of California recently granted the Mount Shasta Power Corp., a subsidiary of the Pacific Gas & Electric Co., authority to proceed with the Pit river hydroelectric power plant project in Northern California, by which it is proposed to bring power to San Francisco. The proposed plans call for the construction of five or more hydroelectric plants on the Pit river, utilizing the water thereof between the confluence of the Fall river and the lower end of the big bend, between which points the construction of power plants and appurtenances will develop in excess of 300,000 kw. The project is estimated to cost $125,000,000.

# Westinghouse 1920 Engineering Accomplishments

## Review of Year's Progress Gives Evidence of Increases in Capacity of Electrical Equipment and Its Application to Central-Station and Industrial Operations and Ship Propulsion

By H. W. COPE

*Assistant Director of Engineering, Westinghouse Electric & Manufacturing Co.*

The most notable engineering achievements of the Westinghouse Electric & Manufacturing Co. during 1920 probably have been in connection with business obtained from many of the most important customers, because of the great business activity through which the country has passed. Bigger problems have arisen in ever-increasing numbers. Super-power stations are being designed for ultimate capacities of 300,000 kw. in order that our diminishing supply of coal may be utilized economically, and for the elimination of uncertain and expensive coal transportation.

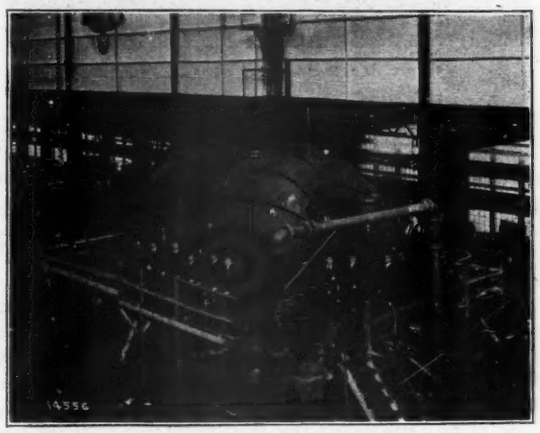
In this trend toward large stations, the Westinghouse company has played an important part. The combined capacity of steam turbines of greater than 25,000 kw. ordered this year total nearly 500,000 kw. Notable among these installations are the Colfax station of the Cheswick Power Co., a subsidiary of the Duquesne Light Co., Pittsburgh, and the Hellgate plant of the United Electric Light & Power Co., New York City, the former being located at the coal mine and the latter at tidewater. At the Colfax station the first 60,000-kw. unit was placed in operation on Dec. 18. This is the second 60-cycle, triple-element, turbine-generating unit of this size which has been placed in operation. Additional units have also been ordered by companies such as the Commonwealth Edison Co., Chicago; Narragansett (R. I.) Electric Light Co., United Electric Co., Springfield, Mass., and Virginia Power Co., Charleston, W. Va.

In the hydroelectric field a Westinghouse 32,500-kv-a., 25-cycle, 150-r.p.m., vertical water-wheel generator was placed in operation. This is one of three units at Niagara Falls, which are the largest in the world.

### Transformers Being Built to Operate at 220,000 Volts.

Other apparatus besides water and steam turbines have naturally followed the development towards larger units. At the Colfax plant the Westinghouse company installed the largest single-phase, oil-insulated, water-cooled transformer that has ever been built. It has a rating of 23,600 kv-a., at 60 cycles and 12,000/132,000 volts. There have been designed and are now being constructed transformers operating at the highest commercial voltage adopted for the transmission of power. This order covers seven 16,667-kv-a., single-phase, 60-cycle, 12,000/220,000-volt, oil-insulated, water-cooled transformers to be installed by the Pacific Gas & Electric Co., San Francisco.

For the Hellgate station of the United Electric Light & Power Co., an order was received during the year for oil circuit-breaker equipment which is said to be the largest single order ever placed for circuit-breakers. They include capacities higher than have ever been built. The layout of this equipment involves special features of design differing radically from previous practice in switchboard construction. The fundamental idea



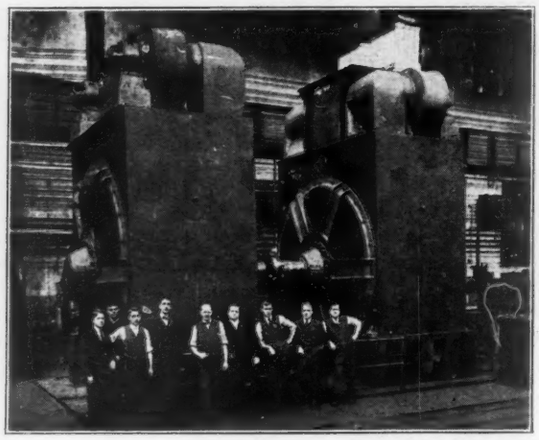
Section of 60,000-Kw. Westinghouse Turbine.

involves segregation of the phases in a type of construction that will prevent the possibility of phase-to-phase short-circuits in bus-bar structures.

At the plant of the Philadelphia Electric Co. there has been installed two 1750-kv-a. induction-type regulators which have the largest capacity of any induction regulators yet built. They are installed on the low-tension side of the transformers supplying the two 66,000-volt tie lines between the Schuylkill and Chester generating stations, which service demands the maximum of reliability. Induction-type regulators of Westinghouse manufacture were selected by the operating company after careful analysis of synchronous boosters and step induction regulators.

In the automatic voltage-regulator field there has been developed a face-plate type of regulator for service corresponding to that previously filled by the vibrating-relay type of regulator. The first commercial installation of this type of regulating equipment is being installed at the Colfax plant of the Cheswick Power Co. for controlling the 60,000-kw. turbine-generating units.

In the railway field two of the outstanding demonstrations of Westinghouse engineering consist in the continual proof in actual service of the remarkable performance of the a-c. substations on the Norfolk & Western, Pennsylvania, and New Haven railroads, which have added one more year's achievement to their past records. In addition, the initial installation of Westinghouse 3000-volt, d-c. locomotives and substations on the Chicago, Milwaukee & St. Paul railway is demonstrating each day that thorough analysis of the requirements and designs produces electrical



Motors for Propulsion of a Battleship.

equipment that is nearly perfect. Some mechanical defects developed on these locomotives but measures for correction under way will without doubt eliminate these faults.

### Marine Equipment Advanced During Past Year.

The Westinghouse company has been active in developing apparatus for marine operation during the entire year. Its first electrically propelled battleship, the *Tennessee,* went into commission this year and has had preliminary sea trials. The electrical equipment for the battleships *Washington* and *Idaho,* sister ships of the *Tennessee,* has been shipped and is now being installed. Designs have been completed and work is well under way for the manufacture of 60,000-hp. electrical equipment for four new battleships (the largest ever built or even contemplated). Designs have been completed and work is also well under way for 180,000-hp. propelling equipment for two battle-cruisers. Practically all of the auxiliaries on board all of these ships are electrically operated. During the year the electrical equipment for 15 submarines has been completed.

The electrical equipment for a 300-ton Diesel-electric-driven yacht was furnished and equipment for a Diesel-electric yacht of larger size has been shipped and is now being installed. The electrical equipment for the auxiliaries for use on the first Diesel-propelled merchant ship to be built in this country will soon be shipped.

### Developments in Industrial and Mining Equipment.

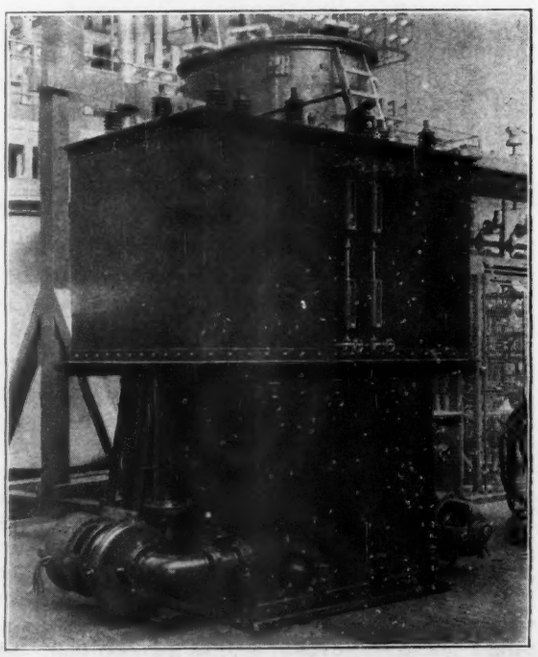
The accomplishments of the Westinghouse company along industrial and mining lines have been important and varied. Among the steel mills there has been a distinct tendency toward the installation of turbine units in power plants, to the exclusion of both steam and gas engines. The size of power plants in some of the steel mills now compares very favorably with some of the large central stations.

During 1920 the Westinghouse company received orders for a 5000-hp. reversing motor from the Dominion Foundries & Steel Co., in Canada, to drive a 27 by 40-in. universal plate mill. The Atlantic Steel Co., Atlanta, Ga., purchased a 5500-hp. reversing motor to drive a 28-in. reversing blooming mill. There is being built for the West Virginia Metal Products Co. an equipment to operate a 72-in. reversing copper mill, the largest installation of its kind. At the Bethlehem Steel Co. there has been placed in operation an equipment driving a 60-in. universal plate mill, the largest in this country, and there is now being installed at the plant of the Follensbee Bros. Co. the reversing equipment for a 30-in. two-high bar mill, a new application for reversing drive.

During the past year some of the company's equipments in commercial service have broken the world's tonnage record. One of these is the reversing equipment driving the 30 by 42-in. universal plate mill of the Steel & Tube Co. of America, and another the 84-in. tandem plate mill at the Brier Hill Steel Co.

In the paper industry there has been installed a new automatic regulator at the Gould Paper Co., Lyons Falls, N. Y., where it has continuously demonstrated its practicability in commercial service. A number of orders for complete equipment, covering motors, control and regulators, have been received, and the apparatus will soon be in service. These regulators mark a new epoch for the paper manufacturers. A new patented load regulator for motor-driven pulp grinders has been installed in trial service, which marks another advance in the application of electrical equipment in pulp mills.

In the wood-working industry there has been developed a high-frequency motor, and other



Liquid Rheostat for Use in Control of Ship-Propulsion Equipment.

improvements are in progress at the present time which will be announced later.

In the textile industry the following developments may be mentioned: Four types of motor for silk spinners; motor and control for cotton-cord drive; motor and control for variable-speed cotton spinning; motor and control for roving-frame drive, and d-c. motor and control for tandem tantering and mercerizing machines. Throughout the country there has been a continued increase in the substitution of individual frame drives for group drives.

### Electric Mining Locomotives Constructed in Large Sizes.

In the mining industry it is worth while to refer to the 35-ton mine locomotives supplied to the Cambria Steel Co. These locomotives are the largest single-unit locomotives installed for 250-volt mine service. They are equipped with Westinghouse HL control and airbrakes, as well as being arranged for dynamic braking. Five 27-ton quencher locomotives are to be used in by-products coke oven works for the Cambria and Carnegie Steel companies. They embody distinctive features not previously incorporated in locomotives for this service. They are equipped with automatic and manual electropneumatic control.

Much has been accomplished in magnetically controlled mine locomotives, and there is a strong indication of increased demand for this control. Interesting applications of this equipment have been made to car dumpers, ore bridges, hoists and similar machinery, but space does not permit of detailed reference to them. Attention should be called to a 1700-hp., 25-cycle motor driving a turbine-type blower supplied to the Inspiration Consolidated Copper Co.

Production of a large number of motors for vibrating screens, unique in design and broad in their application in the mining and allied industries, has been accomplished during the year. Through close co-operation with the engineers of the Utah Copper Co. this very special motor has been developed for the Mitchell vibrating screen which promises to revolutionize the principle of handling materials wherever classification by volume is done.

### Developments Made in Equipment for Various Industries.

Automatic substation equipment has proven itself so successful in railway operation that with necessary modifications it has been applied in coal mines with equally favorable results.

A number of applications of motors in coal-loading machines have been made. Development of both mechanical and electrical parts of this equipment has shown great promise during the past year. Continued development of permissible apparatus for storage-battery locomotives in gaseous mines has been carried on.

A new idea in the drilling of oil wells with electric motors has been perfected during the past year, consisting of two standard two-speed pumping motors driving the same countershaft and performing more successfully the operations incident to drilling. This arrangement holds promise of entirely revolutionizing accepted methods of drilling with either standard or rotary rig.

The electrochemical and electrometallurgical field is always subject to new developments owing to the improved method of applying electricity in many of the branches of this art, and the past year has been no exception. A new furnace regulator promises to give better results than any

Single-Phase Transformer to Be Installed in Plant of Duquesne Light Co.

regulator yet manufactured. Ten of these regulators are now in successful commercial service.

Another regulator, known as the step-induction type, has been developed to take the place of the old type of induction regulator. Some 30 regulators of this type are now in commercial use for controlling graphite, carborundum, zinc and similar furnaces.

Impregnation and treatment of motor windings for use in the chemical industry have been perfected to a high degree during the past year, and now permit of the successful use of motors in those applications which have been heretofore considered hazardous.

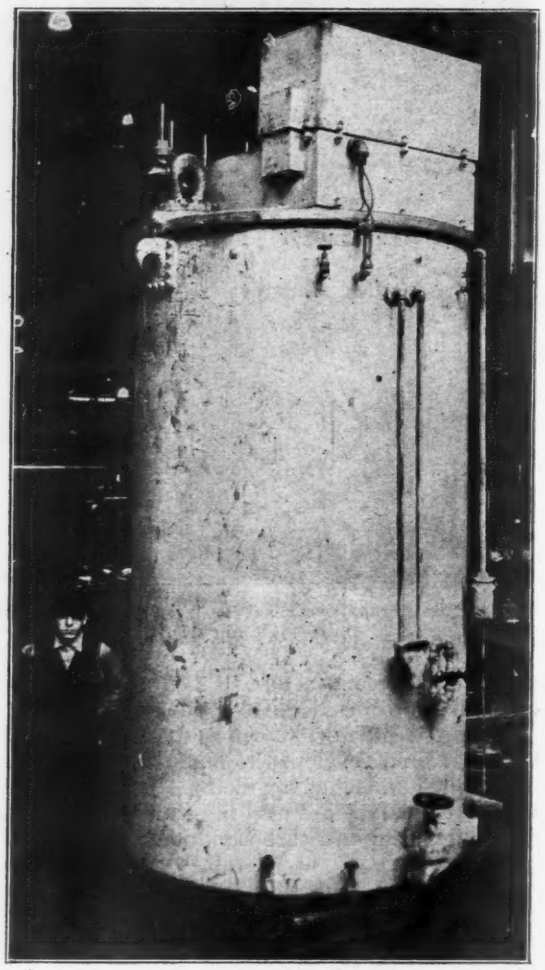
The largest and most spectacular installation of Cottrell precipitating apparatus during this year was supplied by the Westinghouse company to the United Verde Copper Co. at Jerome, Ariz.

### Large Demand Experienced for Motors of Small Size.

During the first nine months of the past year there has been an enormous demand for fractional horsepower motors for the operation of labor-saving appliances in homes, offices, stores and factories. Large quantities of motors have been supplied for driving washing machines, ironing machines, vacuum cleaners and other household appliances. In offices and stores these little motors are used extensively in driving adding machines, calculating machines, meat and coffee grinders and a number of other labor-saving devices. In the industries they are being

used more and more in connection with portable electric tools, air pumps, water pumps and foundry riddles. It is gratifying to note that these small motors have been remarkably successful in operation even on many appliances which are subject to little or no attention and often have much abuse and overload.

Power and light on the farm and in rural communities has been receiving much study and has been the subject of considerable development. A low-voltage portable motor has been developed for use in connection with individual electric farm units, and there has been a rapid increase in the use of low-voltage d-c. motors for driving all sorts of machinery and appliances on farms. In studying the demand of the farmer in connection with the use of energy from central-station circuits a combination switch, fuse and lightning arrester has been developed which is both simple and substantial in character. Considerable tabulated information has also been distributed to central-station companies in farming communities, outlining in a simple way how groups of farmers can organize and obtain electric service cheaply.



Induction Regulator for Use on 66,000-Volt Tie Line.

### Central-Station Business Shows Industrial Expansion.

In the face of financial stringencies which have made expansions difficult for the central-station companies, much has been done in the taking off of power load and the elimination of small individual power plants which are comparatively inefficient. One central station having an industrial load of 312,000 hp. by means of Westinghouse equipment has replaced 87 individual plants with a total of over 25,000 hp. in capacity during the past year. It is interesting to note a further tendency on the part of central-station companies to turn over their merchandising activities insofar as the sale of household appliance is concerned to contractor-dealers and the retail electrical stores.

### Electric Shovels Demonstrate Advantages Over Steam Shovels.

The past year has seen a further development of the largest installation of electric shovels in the world. This is at the mines of the Chile Exploration Co., Chile, South America. The copper ore available is located on a mountain range and has a very low copper content, requiring that enormous quantities of the ore be mined at a low unit cost. Steam shovels, which usually cost considerably more to operate than electric shovels, were formerly used for this work. In this particular case the cost of operation of the steam shovels was even higher than usual, due to the fact that coal and water had to be hauled long distances from the company's property at the sea coast to the mountain. Five large electric Bucyrus shovels driven by Westinghouse a-c. motors were installed in the latter part of 1917, the power being transmitted at high voltage to these shovels and the voltage reduced to 500 volts by step-down transformers located on the rear of the shovels. The operation was so successful and the reduction in cost so great that five more of these large electric shovels were placed in operation at these mines during the past year. The hoist motion on the shovel is driven by a 250-hp. motor, and the swing and thrust motions each by a 75-hp. motor.

Electric shovels are used by the Hydro-Electric Power Commission of Canada in digging the Queenstown-Chippewa canal around Niagara Falls. There is a difference in elevation between Lake Erie and Lake Ontario of 330 ft. This power development will operate under a 305-ft. head. The flow of water in the canal, when the plant is operating at full capacity, will be 10,000 ft. per sec., and the plant will develop 300,000 hp. The length of the canal will be 13.5 mi. The Welland river is used for 4.5 mi., the remaining 9 mi. being excavated. Bucyrus electric shovels used in digging this canal have made some remarkable output records in the last year. In one 10-hr. shift as high as 4930 cu. yds. of earth were removed by one 300-ton shovel. This is the equivalent of a day's work of 600 men. The shovel making this record, which is of the revolving type, is the largest ever built, having a boom 90 ft. long. There are three shovels of this size and four smaller ones used on this work.

The year 1920 simply marks another milestone in the great achievements of the Westinghouse company, and it is safe to predict that at the close of the next and each succeeding year equal and even greater accomplishments will be added to the long record of engineering accomplishments.

# Progressive Plan of California Electrical Campaign

## Outline of Activities for Coming Year Indicates Distinctive Feature for Each Month's Concentration by All Members of Electrical Industry and Associated Interests in the State

Following abundant returns in recompense for the 1920 activities, the California Electrical Co-operative Campaign will go forward this year with greater collective energy toward the goal of "electric service for every industry and every home in California."

In an advance bulletin issued by the campaign executive committee and mailed out by Secretary Robert L. Eltringham, some of the plans for 1921 are announced for the purpose of suggesting a definite method of co-operation by the organizations contributing to the campaign. This bulletin contains the following tentatively arranged program of subjects for the first six months of 1921:

For January, industrial and commercial lighting; February, convenience oulets; March, contractor-dealer accounting; April, financing hydro-electric development through self-interest; May, salesmanship and service to the public; June, our responsibility to the electrical industry. Other subjects for later months are under consideration, and suggestions are invited which will enable the advisory committee to make this series complete and timely.

During 1921 the field representatives will continue the various lines of work which have been the subject of the campaign's effort during the past two years, but with special attention to a single, particular phase of this work during each month of the year. This special effort will be to present the subject chosen for each month at meetings of the electrical industry in all localities throughout the state where a sufficient number of representatives of all branches of the industry can be gathered together to justify the holding of such meetings.

### Co-operative Work to Be Concentrated Upon Monthly Subjects.

At the meetings it is planned, after presentation of the subject in an address by one of the representatives of the campaign, to encourage those in attendance to discuss and take such concerted or individual action on the subject as local conditions suggest and justify. It is also planned that during each month the contributing members of the campaign will co-operate in keeping the current month's subject in the minds of the members of the industry by means of personal discussion, letters and advertising on the subject, in that way inducing each individual to a realization of the importance of the subject and impelling them to act accordingly.

In order that each person co-operating with the campaign may be informed regarding the subject of each monh's work a bulletin will be mailed to all contributors before the first of each month, giving the subject for that month and stating in concise form the essential facts which will form the basis for its presentation to the industry. Each contributor will be requested to have the bulletins copied and distributed to all members of his organization whose work gives them a direct interest in these subjects, or brings them into contact with others who have a direct interest. Each one is instructed to study the bulletins and to discuss and promote interest in the subjects wherever and whenever opportunity offers.

### Progress and Future Plans in Convenience Outlet Campaign.

An adobe electrical home in Windsor square, Los Angeles, promises to be the record breaker in many respects, due to the novelty of the idea of an adobe house, designed after the old Mexican-California style of architecture, being modernized by means of electricity. Every effort is being made to complete a home worthy of the novel idea. This home will be opened in January and is expected to attract at least 50,000 visitors. The advisory committee will increase its efforts on convenient outlets and electrical homes during 1921 and expects to open for exhibition at least six more modern electrical homes during the spring and fall of this year.

In order to afford the benefit of their experience in planning and exhibiting modern electrical homes to the many inquirers among the electrical industry for information on this subject, the advisory committee has prepared a bulletin on "Modern Electrical Homes," which is now available for distribution. The series of ten stories on the various rooms of an electrically equipped modern home, for publication in newspapers throughout the state, is complete and these articles will appear during the early months of 1921 in connection with other activities relating to convenient outlets and appliance merchandising.

Through the efforts of the representatives of the co-operative campaign the use of the standard accounting system for electrical contractors and dealers has been largely extended in California. This use has shown the necessity for a better understanding of accounting principles by contractors and dealers, and arrangements have been made for the University of California to establish a correspondence course in accounting based upon the standard accountng system for electrical contractors and dealers. With the co-operation of the California State Association of Electrical Contractors and Dealers, a standard accounting system has been installed in a contractor-dealer's establishment in Berkeley, and P. B. Kelly, of the University of California, is preparing the lessons for the correspondence course, based on actul experience in the use of this system. When

this course of study is ready to be offered by the university, the co-operative campaign will undertake to interest contractors and dealers in it, and expects thus to greatly increase the value of the possess it or who will install it at a later date.

The installation of an exhibit for demonstration of the advantages of proper industrial and commercial lighting at San Francisco was completed Nov. 18, and the first lecture and demonstration was given Nov. 22, with the members of the California Industrial Accident Commission and the San Francisco Electrical Development League as specially invited guests. The California State Industrial Accident Commission is much interested in the presentation of the subject of correct and adequate lighting in all industrial and commercial establishments, because of its direct relation to safe and hygienic working conditions for persons employed in these establishments. To co-operate with the advisory committee in presenting this subject the commission allowed the use of the safety museum rooms of the Industrial Accident Commission in San Francisco, for the industrial and commercial lighting exhibit, and is sending out invitations to the industrial and commercial organiations of the San Francisco Bay region to attend the lectures and demonstrations.

### Campaign Plans for Industrial and Commercial Lighting.

Following the plan of first selling this idea to the individuals within the electrical industry the specially invited guests at the lectures and demonstrations, Nov. 27 and Dec. 3, were the electrical contractors and dealers, the power company representatives, the jobbers, the manufacturers' representatives and electrical engineers of the San Francisco Bay region. The average attendance at these meetings was 82, which is approximately the capacity of the exhibit room. The lectures and demonstrations will be given by various members of the San Francisco Bay Cities Chapter of the Illuminating Engineering Society on each Friday evening, and special invitations will be sent out to individuals and business organizations of all lines of industry and business until the entire field for the subject of industrial and commercial lighting has been covered.

In order to avoid commercializing the exhibit no demonstration will be made except under the supervision of a representative of the advisory committee, and only at times publicly announced. The men who give the lecture will be introduced as members of the Illuminating Engineering Society and their commercial affiliations will in no case be mentioned.

A similar exhibit for Los Angeles territory is now under construction and probably will be in operation in January. The construction of a portable exhibit for use in the other cities of the state has been authorized by the committee and is in course of preparation. By means of those three exhibits the advisory committee intends to demonstrate the value of correct and adequate lighting to every industrial and commercial organization of any consequence in California, and believes that results of enormous magnitude will accrue both to the electrical industry and to the public.

## SERVICE DEMANDS EXCEED PRESENT PLANT CAPACITY.

**Chairman of Idaho Commission in Discussing Service Problem Points Out Duties of Citizen in Development of Community Resources.**

The need of more economic production in order to reduce the cost of living has brought an insatiable demand throughout the country for more electric light and power, telephones, transportation and other services, with the result that the capacity of the $15,000,000,000 worth of plants which have been built in the last 25 years has practically been exhausted. In every state the demand is incessant and billions of dollars of additional money should be obtained from thrifty private investors in the next few years for additional equipment in order to keep pace with it. A. L. Freehafer, chairman of the Public Utilities Commission of Idaho, in a recent discussion of the service problem said:

"The matter calls for honest and intelligent study by the public of the unusual conditions which now confront the utilities. The public should be fully informed regarding this question which affects it so vitally. We all know how the prices of commodities in general have soared. Reliable statistics show advances over 1914 prices of 100%, 200% and even 500%. Measured by actual production the cost of labor has increased 100% or more. Manufacturing and merchandising lines have been able to keep pace with these advances in cost of production, because the prices they have been able to charge are not subject to regulation.

"Public utilities, being subject to regulation and control, could not enter the race, but must needs await the pleasure of regulating bodies. The public, having no effective weapons to fight back the advancing cost of commodities, turned its attention to public utility regulation and brought pressure of public opinion to bear on the regulatory bodies to prevent increases in rates or to hold increases to the lowest possible minimum.

"The result which has followed was inevitable. Money has flowed freely into the channels of production and merchandising of commodities, attracted by high rates of interest, and public utilities have not been able to meet demands for new service because of a lack of funds for extensions or new developments. Regulating bodies have hesitated to take drastic action to relieve the situation, in the belief that the abnormally high prices were only temporary and that the utilities could weather the storm until the crest of the wave had passed.

"It appears now that it may take a long time to deflate our currency and inflate our supply of commodities. It is not possible to continue this policy longer unless we wish to see our progress cease and our development stagnate. Almost daily complaints are received at the offices of the Idaho commission of the failure or refusal of water companies or telephone companies or electric companies to make extensions necessary to meet the demand for new services, and the stereotyped answer of the utility is, 'We are not able to secure money for extensions or new development except at rates which are prohibitive in the face of our earnings under existing rates.'

"It is the duty of every citizen who has interest in the progress of the state and development of resources of the community to get the facts before the public. Our people are not unjust when they understand, unless it be the political demagogue or agitator who has some selfish end to serve. Most of the troubles vanish when they are brought into the light. Our utilities can be financed economically—and the patron is certainly interested in such result—if inventories are assured that the investment is secure and the earnings will be stable. This cannot be absolutely guaranteed by any one, but with intelligent and fearless regulation and competent management the investor can have greater assurance of security and certainty of regular return than he can have from investments in industries which are more or less speculative in their nature."

# Manual Controllers for Direct-Current Motors

## Sixth of a Series of Articles on Principles and Application of Motor-Control Apparatus—Types of Speed Regulators and Their Uses—Drum-Type Controllers Applied to Crane and Hoist Duty

By G. J. KIRKGASSER and E. W. SEEGER

**Motor Speed Regulators.**—As previously explained, varying the resistance in the armature circuit varies the speed of the motor below normal running speed. The simplest type of speed-regulating rheostat is similar to the plain starting controller except that the resistor is designed for continuous service instead of only for accelerating duty. At the lower end of the lever there is a notched pawl (see Fig. 31), which engages with a spring so that the lever may be held on any contact, but in case of interruption in the power supply the no-voltage release trips and the lever is thrown to the "off" position as in the case of the starting controller.

The usual speed adjustment provided by the armature-resistance regulator is between half speed and normal speed, although in some cases a little lower than half speed may be provided for. The motor, however, may stall if the load increases suddenly when it is revolving at the lowest speed.

For controlling small motors and motors driving such machines as ventilating fans, in which the torque decreases with reduction in speed, regulators with armature resistance are used largely, the resistor capacity tapering in proportion to the amount of resistance inserted. This is because the power required is less at reduced speeds.

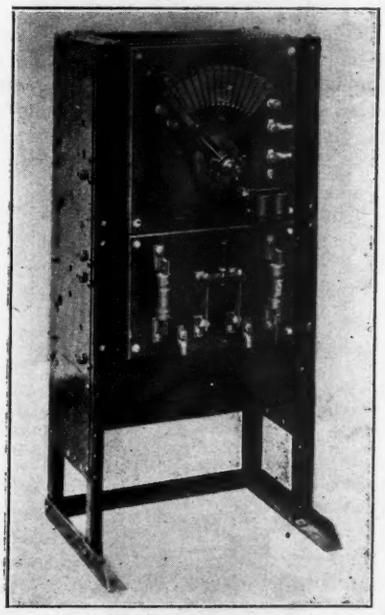


Fig. 31.

Cutler-Hammer speed regulator with knife switch and fuse panel mounted on floor-type frame.

In the case of motors driving machine tools, hydraulic pumps, etc., the current in the armature circuit does not decrease with reduction in speed. The resistors used in speed regulators of the armature-resistance type in this service

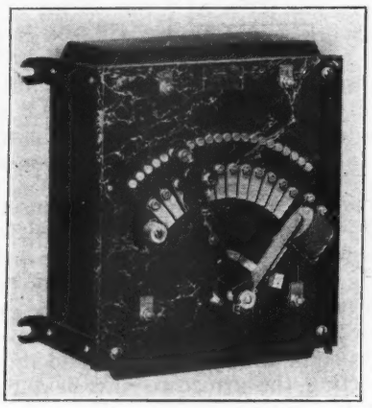


Fig. 32.

Compound starting controller of the sliding-arm type, made by Union Manufacturing Co.

must be designed to withstand a large amount of current. Instead of having a tapering resistance capacity it is necessary that each step of resistance have equal current-carrying capacity, the amount of resistance being enough to provide for a 50% reduction in voltage with normal current and all resistance in circuit.

The connections are similar to those of a starting controller, and are indicated in Fig. 22. Slight changes are made in the connections when an overload release is used. Controllers for this service are made in both reversible and non-reversible types.

In designing or selecting a speed regulator of the armature-resistance type it is therefore necessary to know whether the regulator is to be used for what is referred to as "fan duty" or "machine duty."

For the regulation of motor speed above normal, resistance inserted in series with the shunt-field circuit of the motor is employed. This reduces the field strength and the armature speeds up in order to compensate for the weakened field and maintain the required counter e.m.f.

Speed regulators are designed to have the acceleration of the motor from rest to normal take place without any external resistance in the field circuit, to insure full field strength necessary for starting. After the motor is running at normal speed with no starting resistance in the arma-

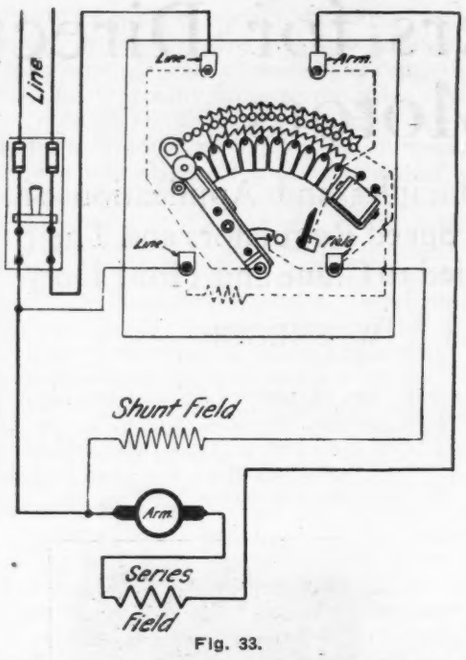



Fig. 33.

Diagram of connections for compound starting controller.

ture circuit, then resistance may be inserted and taken out of the field circuit as desired for speed adjustments. A combination starting and speed-regulating controller of this kind may be of the sliding-lever type, multiple-lever type or drum type, as well as the various automatic types. Figs. 32 and 33 show the construction and the method of connecting the armature and field resistance in the motor circuits.

Where a wider range of speed adjustment is required the above class of compound apparatus may be used with the difference that continuous-duty resistors are substituted for the starting resistors, so that speeds below normal as well as above normal may be provided.

The interior of a drum type of compound speed regulator is shown in Fig. 34. The armature resistors used for making speed adjustments are mounted separately, while the smaller capacity shunt-field resistor units are mounted in the screen-protected inclosure below. The movement of the controller lever provides for all speeds, the armature circuits being handled by the drum segments and fingers in the main part of the inclosure, and the shunt-field circuits by a slider arm passing over contacts connected to the field resistor units. The one lever at the top

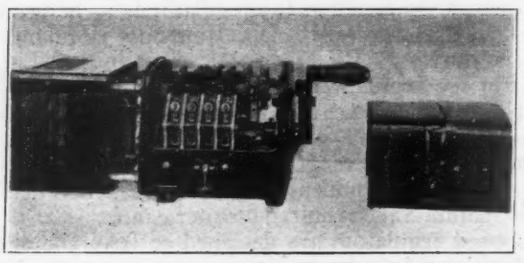


Fig. 34.

Speed-regulating drum-type controller which provides for speed reduction below normal and speed increases above normal. The field resistance is carried in the small screened-in compartment below, which is lowered to show the construction. The contact fingers in the main portion of the drum are for the armature current and are connected to exterior resistors.

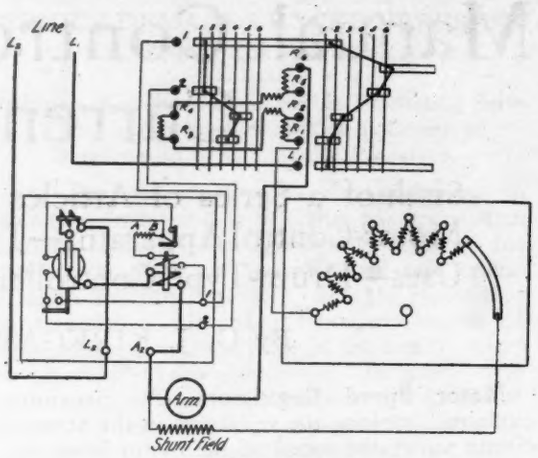



Fig. 35.

Diagram of connections for drum type controller shown in Fig. 34.

controls both the reduction below and the increase above normal speed.

The no-voltage release and the overload release (when employed) are furnished separately with this class of apparatus, and are connected in circuit as shown in Fig. 35. This same type of apparatus is also made for regulating the speed in the reverse direction. A speed regulation from one-half normal to four times normal may be obtained with this apparatus used with an adjustable-speed motor. Such equipment is employed with machine tools, for example, in cases where manual operation of the controller is desired.

**Drum-Type Controllers Used With Cranes and Hoists.**—Drum-type controllers, while used for speed adjustments of shunt, series and compound motors variously applied, find their greatest use in connection with cranes, bridges and hoists.

In the Westinghouse type of controller, contactors are operated by cams mounted on the controller shaft, the contactors for the supply current being protected by magnetic blow-outs which assist in extinguishing any arcs caused by the contacts. The opening of the contacts is accomplished by a compression spring which functions when the cam is moved away from

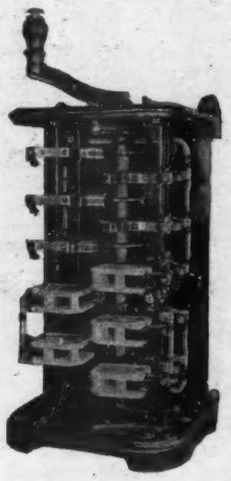


Fig. 36.

Westinghouse drum-type controller with cover removed, showing contact fingers.

the closing roller. Fig. 36 shows this type of controller.

In the Cutler-Hammer drum controller, straight-line pivoted fingers carried on a square shaped segments on a revolving drum, which is

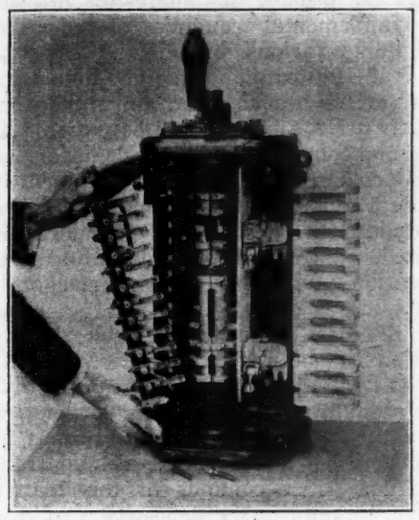


**Fig. 37.**

Interior of Cutler-Hammer drum-type starting controller, showing the cylinder which is revolved by the lever. The fingers, which are mounted on a shaft, may be removed in one unit, and the arc shield swung to the right. This shield practically surrounds each finger and protects the contacts against damage due to arcing.

rotated by the lever above. The segments are arranged so that their rotation brings them in contact with the various fingers, resulting in cutting in and out sections of the resistor. The resistor is mounted separately in some out-of-the-way location. For repair, replacement or inspection the entire finger assembly may be taken out by removing bolts at the top and bottom, and the drum carrying the segments can be taken out

**Fig. 38.**

Construction of drum-type straight-line finger contact used in Cutler-Hammer apparatus.

through a removable top-plate, as shown in Fig. 37. One of the fingers with its drop-forged copper tip is shown in Fig. 38.

Dynamic braking is employed with series motors on hoists in order to control the lowering operation. In this case the motor connections are changed by the drum controller so that the motor operates as a generator during braking periods.

*(To Be Continued.)*

## EDUCATING THE PUBLIC TO UTILITY PROBLEMS.

**Publicity Plan to Create Friendly Feeling Between Public and Utilities Outlined in Address Before Central Electric Railway Association.**

By Bernard J. Mullaney.

*Director, Illinois Committee on Public Utility Information.*

Out of the circumstances of the past five years members of utility commissions, public officials and many business men have been acquiring a better understanding of the problems of public utilities. But the man in the street—the public to which all official and regulatory power bows in the long run—is still in the dark. The inevitable consequence of this public ignorance is suspicion and hostility. The antidote to it is education, for as surely as ignorance breeds suspicion and hostility, so education and enlightenment will breed friendliness.

The utility business, its problems and its relation to the public must be, in some way, made interesting to the man in the street before he will take much notice of it. The means to that end is the thing called publicity. Ways and means of educating by publicity are as varied as contact with one another in everyday life. Opportunities for this are everywhere; conversation across the lunch table, or in the smoking room of the sleeping car; addresses to the Chamber of Commerce, the Rotary Club, the Women's Club, or other civic organizations; cultivation of better understanding of the business they are in among our employes; statements to users of the service and security holders, and so on.

The best channel of all for educative publicity effort is the newspaper, because it is literally true that almost everybody reads the newspapers. Certainly, the very few who do not read them follow the lead of those who do. If the public holds erroneous ideas about public utilities those ideas have reached the public mind mostly through the newspapers, and the logical route to dislodging them is through the newspapers. All of the other indicated channels for educational effort are useful, but their usefulness is multiplied when opportunities for newspaper publicity are fully employed; they can be used to supplement the newspaper but they cannot take its place.

To be effective educational publicity in behalf of a utility company, a branch of the industry or the industry as a whole, must "come clean" both in methods and motives. If we do not start with that idea paramount there is no use in starting. False pretenses, spacious arguments, half truths, one-sided presentation of facts, do not accomplish the desired results. In fact, they have the contrary effect, because the only kind of publicity or educational matter that is any good is the kind that is used, the kind that gets itself printed and read. If it goes to the wastepaper basket it is simply wasted labor and material.

In attempting educative publicity work it is practically essential to get the assistance of men who are qualified to handle the matter from the public's side—who can see and who do see some aspects of the situation the way the man in the street sees them—and who have had training and

experience in writing for the public. Men having this special equipment will have no difficulty in finding usable material.

### Creating Favorable Impressions on Public Through Local Newspapers.

Facts, not arguments, should be the foundation of all publicity effort in behalf of all branches of the public utility industry, as well as in behalf of the industry itself. The fundamental economic facts of the industry plus the special or "personal" facts of origin, construction, operation and maintenance should be given. Facts are better than arguments in presenting the economic situation of the utility industry because they produce better and more stable results. An impression can be made upon a person or a group by some brilliant argument or sensational presentation of a particular matter, as by a smashing editorial or a cleverly written magazine article, but the effect of that is fleeting. The impression that lasts is that built up by reading a three-line item here, a two-inch item there, a half-column somewhere else, and so on until the reader eventually acquires an impression and an opinion without knowing where he got it. Impressions thus created are permanent until statements of fact at the bottom of them are conclusively controverted.

In every branch of the public utility industry we have an abundance of facts that can be made interesting and instructive and therefore helpful educationally. If proper use of these resources is made the public will absorb them and from them will rise the kind of public opinion—an informed and well-grounded and stable public opinion.

The place to start getting educational publicity matter used, established and made effective, is in the home-town newspaper and the person to get it started is the local utility manager. The way for him to start is by using the columns of that paper to advertise his business. Many managers of public utilities think they have nothing to advertise unless they happen to have electric appliances to sell; that use of their transportation, or other utility service, comes automatically; that the public must use it or do without. The biggest thing they have to sell is their service and the biggest factor in selling their service is good-will.

Business of every kind is largely a selling proposition. The largest single factor in selling anything is good-will, whether it be the individual good-will of a purchasing agent or the mass good-will of a purchasing public. The more good-will the more sales has been demonstrated so often that it ought to be no longer debatable. Using the advertising columns of the home-town paper to cultivate this good-will for public utility service is the intelligent thing to do.

Habit has a good deal to do with the kind of news that is or is not printed in newspapers. Intelligent cultivation of the home-town newspaper and intelligent employment of local opportunities for discussion will stimulate the habit of printing news about the utility business. The newspaper publisher is as ready to print news about the utility business as he is to print news about the steel business, or the railroad business, or the banking business, but he will not get the habit of doing so until those in the utility business see to it that he gets information about the business that is really interesting to him and his readers.

It is not to be expected that the local utility manager can provide this interesting information on the fundamental economics of the utility industry in its various branches, publication of which is the ultimate object. The industry itself and its various branches can and should provide the information. This should be done on an organized and consistent basis and the informational material collected, compiled or prepared should be made available to every kind of publication. But results will be immensely enhanced if the organized, educational, publicity effort has the co-operation of the local utility manager in his home town.

The Illinois Committee on Public Utility Information has been at work now about a year and a half. It sends out regularly informational matter ready for use in the newspapers, which some of the keenest, practical utility men in Illinois think is all helpful material, and from 250 to 300 newspaper columns of this matter are used every month in the newspapers of that one state. As a by-product of the newspaper publicity work, pamphlets on various phases of the utility industry have been published, which have been circulated throughout the United States by the larger utility interests, literally by the hundreds of thousands of copies. Educational matter produced by the committee, again as a by-product of this newspaper work, goes by request to all of the libraries and higher educational institutions in the state.

## NEW YEAR TO BE ONE OF PROSPERITY, STATES EXECUTIVE.

Commenting on the outlook for general business, particularly as affecting the electrical industry, William E. Manning, vice-president of the Youngstown (O.) Sheet & Tube Co., recently stated his belief that the coming year will be for the most part one of genuine prosperity and that business will be conducted without as much difficulty as in the past. Through the vicissitudes of 1920, Mr. Manning stated, his company has done its best to serve its customers and protect their interests, and it has been rewarded with their fine friendship and loyalty, which have done much to compensate for the abnormal conditions of the time.

## URGE CO-OPERATION BETWEEN PUBLIC AND UTILITIES.

The directors of the Indianapolis (Ind.) Board of Trade recently adopted resolutions calling attention to the fact that the community cannot grow and prosper unless there is good utility service for homes, factories and business institutions, and urging co-operation between the public and utilities in the present period of financial stress. The resolutions assert "that without reference to any particular company's situation, we express our belief that those who provide utility service are entitled to rates that will cover their expenses and give them a reasonable return on their investments."

# EDITORIAL COMMENT

## *Looking to 1921 in the Central-Station Industry*

Upon the past is built the future, and because of what has passed the central-station industry turns toward the new year in confidence and courage. As we pass out of the old year into the new we feel that we have turned the corner, and that we can be safely optimistic for the future. The last few years have been hard it is true, but it was worth it. The central stations will reap the reward during the coming year upon their sacrifices and achievements of the past.

The central-station industry came out of the war unscathed. Where so many other businesses have had to beg for government subsidies, for temporary federal operation and guaranteed profits, the central-station industry has met the unparalleled demands upon it unaided. Today it can face readjustment with equanimity. It has weathered the past without receiverships and at worst at a higher cost of doing business. The future can hold no worse than what has gone before, but the present forebodes that easier times are approaching rapidly.

Deflation, the ruination of many businesses, helps the utilities. Existing rate increases with declining operating costs tend to equalize those many months before increased rates went into effect, and the time lag once so costly is now beneficial. Those utilities that were able to go along with the minimum of new capital will find the coming year a more advantageous time to float their bonds. The reductions in many stocks will only help to attract the small investor to central-station undertakings.

One of the outstanding phases of the passing year has been the extent to which utilities have sold stock to their customers and residents within the territory they serve. The achievement of the utilities during the past five years, if properly presented, must assuredly convince the most skeptical as to the stability of the central-station industry. Meanwhile, apart from finances, what is the light and power situation as one more year is left behind?

Everywhere the demand for service exceeds the ability of the utility to supply it. Work that had to wait while the munitions of war were made is now being taken up. Millions of new homes will come into being during the next few years, making up for the last years when building was quiescent. The many old houses now not wired would keep the central-station industry busy for more than a year. The problem of the central stations today is not to find more load but to find ways of carrying the load that is waiting.

Milwaukee, Indianapolis, Chicago and many more of our cities are hard put to it to find the generating and transmitting capacity to meet the demands made upon them. It seems as if the central station can never keep pace with the demand upon it. Diversity is, fortunately, being utilized to the full, and many utilities are able to carry the loads they do only be preventing the overlapping of peaks where control is possible. This phase of central-station operation is one deserving of special study and wider application.

As we see it, the central stations face the coming year with financial problems rather than technical problems. The financial problem is that of conserving capital by making extensions and taking on new load where the greatest return is promised. The future is built upon the past. It is out of the past that we stand where we are today, prepared for whatever the new year holds. The central-station industry can face the coming year steadfastly and unafraid because the difficult years are behind, and what lies ahead is full of promise.

## *Change the Taxes That Go to Non-Productive Ends*

In these days of uncertain economies and contracting investments it is refreshing and encouraging to have one of our great dailies discuss in an able and forward-looking editorial the interesting question of taxes and a practicable and useful investment of them. The editorial we quote below was taken from a recent issue of the New York *Tribune* and it furnishes food for careful thought to each one of our readers who is numbered among the taxpayers, and who could help bring about the legislation suggested by that able and far-seeing international financier, Otto H. Kahn, of New York.

"Industry needs capital, the real capital which comes from saving. The saving occurs, but in this country alone no less than four billion dollars a year is taken by tax gatherers and devoted to non-productive governmental activities. To make matters worse, the taxation to a large degree is levied against funds which otherwise would be reinvested and put to social use. No wonder there is a dearth of loanable capital.

"The offense of the excess profits tax in this regard is now generally recognized, and it is agreed that this tax is to go. But the heavy surtaxes of large individual incomes promise to remain and these, even more than the excess profits taxes, dry up at their sources a large part of the sums which else would go toward relieving industry of the crushing interest charges which palsy enterprise and lead to an increased cost of goods and services.

"What, normally, becomes of the large individual incomes? They go only in small measure into personal and family expenses. The recipient of a large income usually spends only a small part; he invests his surplus, and there is money to finance new business undertakings. But now up to 65% goes to the government, and there is corresponding diminution of the store of capital coming on the market.

"Mr. Kahn recently made the interesting proposal that though the surtaxes should be allowed to remain there should be an abatement with respect to the portion of the income that is reinvested. The burden would thus fall on wasters, while the saving and thrifty who do the public good would be encouraged. To the same effect speaks J. A. Hobson, the leading English authority on taxation. He argues for a discrimination between the parts of an income which go to enhancing production and those parts whose scattering involves waste and destruction of capital.

"What may be called demagogic terrorism prevents serious consideration of the true nature and effects of surtaxes. Superficially it seems as if they hit the over-rich, and this is popular. But, though the over-rich are hit, the force of the blow is felt by all of us. It is time to lift the embargo against frank discussion of surtaxes and to assess their real effects. If this is candidly done it will be quickly seen that in their present form they do unnecessary damage to all of us."

## *Public Ownership of Public Utilities*

Public utilities rather naturally constitute a plaything for the unscrupulous politician and a convenient target for public baiting and attack of every kind. The utility cannot pack up over night and quit business; its very permanence increases the delight in abusing it.

The high cost of labor and material, the deterioration in equipment and service that has come about under the last few years of specially strenuous work under almost untold difficulties of every sort, difficulties in raising capital, which at high interest rates have made increased fares and rates necessary. Due to many delays, many utilities' requests for higher rates are now coming up for consideration by civic councils, public utility commissions and other bodies just when the newspapers are acclaiming that the costs of living are going down. The situation is ideal for the soapbox orator, the demagog and the politician who delight to capitalize the utilities' dilemma by turning the situation to their own advantage or that of their cliques.

Good service does not quell the demand for public ownership. The five-cent fare never stilled the demand of the demagog for ownership by the people. So long as there is a privately owned utility, there are the men who strive to stir up strife by demanding that the utility exists for the people, by the permission of the people, and that the profits made out of the people's necessity should go back to the people. This demand can be quieted, as it is being quieted in many cases successfully, by a policy of frankness on the part of the utility telling of what it is doing for the community so that the civic pride is kept alive while faith in the corporation is fostered. This is part of the battle against the agitation for public ownership, but only a small part.

The best bulwark against public ownership by the municipality is ownership of stock by the public. The utility that has the largest number of stockholders among its customers and the people residing in the territory it serves is the utility that can watch with most equanimity the tirades of the demagogues while the wise politician will be silent.

## *Recognizing the Validity of Contracts*

In this readjustment period through which this country and the world generally is passing it is not unusual for some of the larger business concerns to report cancellations of contracts covering goods bought at what might be termed high prices, especially when such commodities are now selling at reduced prices. It is very true that widespread cancellation of contracts indicates a diseased condition of business morals which will sooner or later be reflected in litigation in the courts. A greater recognition of the integrity of contracts is urged to offset this tendency among a few firms who do not live up to their contracts when the market goes against them.

In commenting on this matter a prominent electrical manufacturer recently expressed the opinion that it is an important duty for all concerns to adopt a policy which will combat the evil with the utmost vigor. It is essential that faith be kept and that obligations when incurred be carried out, although this does not imply advocacy of a "pound of flesh" policy.

In abnormal times it is more than ever incumbent on those who have business relations to assist one another to the utmost, but the concern arbitrarily repudiating agreements under threat of interdict of future sales should be turned back to assume its legitimate responsibilities.

# THE WEEK'S NEWS

***Reports of Important Meetings, Developments and Other Happenings of the Electrical Industry and Its Allied Interests***

## GOOD-WILL ADVERTISING CAMPAIGN APPROVED BY N. E. L. A.

**Executive Committee Makes Definite Plans for Conducting Campaign—Committee on Co-operation Appointed—Convention Plans Discussed.**

At a meeting of the executive committee of the National Electric Light Association Dec. 16 in New York City approval was given to a direct good-will advertising campaign over the name of the N. E. L. A. This campaign is designed to tie in the present good-will campaign being conducted by the use of pamphlets, and also by the good-will campaign being made by the manufacturers of electrical supplies. Definite plans have already been made and the advertisements will begin to appear in popular magazines within the next few weeks, supplementing the advertisements of the manufacturers.

A net gain of 80 members was reported by the membership committee since the beginning of the association year.

President Insull stated that upon the request of the public policy committee he had appointed a committee on co-operation with other associations to meet similar committees from the American Gas Association and the American Electric Railway Association, the personnel of the N. E. L. A. committee being S. Z. Mitchell, Charles L. Edgar, H. C. Bradlee, W. W. Freeman, Joseph B. McCall, John W. Lieb, O. D. Young and Martin J. Insull, ex-officio.

The executive committee authorized President Insull to take up with the chairmen of the four national sections and the headquarters staff the matter of fixing the time and place for the 1921 convention; also the form of convention, nature and extent of the program, the preparation and presentation of papers and the subsequent preparation of proceedings of the convention.

## GOLD BONDS OF PACIFIC UTILITY OFFERED TO PUBLIC.

**Pacific Gas & Electric Co. to Devote Proceeds From New Issue of $10,000,000 to Development of Large Hydroelectric Project.**

A new issue of $10,000,000 Pacific Gas & Electric Co. first and refunding mortgage gold bonds, 20-year, 7% series "A," is being offered by the National City Co. and E. H. Rollins & Sons at 99 and accrued interest, yielding about 7.1%. The Pacific company is recognized as one of the largest public service corporations in the United States. Its properties extend into 36 counties in California and serve an estimated population of 1,850,000, including the cities of San Francisco, Oakland and Sacramento. The company operates 24 hydroelectric stations and four steam-turbine plants, having an aggregate capacity of 428,000 hp.

The proceeds from the present financing will be largely devoted to the development of one of the most promising hydroelectric projects on the Pacific Coast, which the company controls through ownership of the Mt. Shasta Power Corp. This project has an ultimate capacity of more than 420,000 hp., of which 126,500 is now in process of development. For more than 40 years the electric business of the Pacific Gas & Electric Co. or its predecessors has been in continuous and successful operation and now contributes more than 60% of the gross earnings, which for the year ended Nov. 30, 1920, were over $34,500,000.

## TO DEVELOP ELECTRIC POWER FROM COLORADO RIVER.

**Hydroelectric Project of Southern California Edison Co. Contemplates Development of 250,000 Hp. for General Purposes.**

With a view of developing 250,000 hp. of electric energy from the waters of the Colorado river and making it available in California, Utah, Arizona, Nevada and Colorado, the Southern California Edison Co. has been granted a preliminary permit by the Federal Power Commission to carry out such a project.

Incident and of great importance to the project is the establishment of a uniform flow of the Colorado river, which would practically eliminate the destructive floods each season. It also creates possibilities for irrigation with subsequent colonization and the maintenance of large populations in the lower Colorado territory, which is one of the most important advantages of the project.

The present irrigable capacity without storage is 750,000 acres. Full control under storage regulation would allow an increase to 3,000,000 acres, which indicates that under present conditions only 25% of the potential irrigating capacity of the stream is being used. The storage basin will be over 200 mi. in length, impounding more than 40,000,000 acre-ft. of water.

This application contemplates the development of power on the Colorado river above the Boulder Canyon project and the permit would allow the Edison company time for surveys, investigation and the perfecting of financial plans for the construction of the dams, conduits, and power houses at Marble canyon and Diamond creek, not including the possible power development in the Grand canyon and other sites along the national park. The total possible hydroelectric development of the Colorado river is over 4,000,000 hp., which is equal to one-half the total hydroelectric power now generated in the entire United States.

Through the complete development of the hydro-electric resources of the Colorado river, which drains a watershed of 250,000 sq. mi. and has an annual run-off of 16,000,000 acre-ft., electric energy could be furnished for the operation of trains on 15,000 miles of railroad consisting of six existing and two proposed transcontinental lines, still leaving 65% of the generated power for general commercial, agricultural and industrial purposes.

To develop an equivalent amount of power by generating plants using oil for fuel would require the burning annually of over 90,000,000 bbls. of oil, which is practically the present production of petroleum in the state of California. The substitution of this enormous increase in hydro-electric energy for that now produced from oil would indefinitely extend the fuel life of the United States navy and the merchant marine which are dependent upon oil supply since the exigencies of the world war brought about a change of coal to oil-burning for navigation purposes.

The Colorado river is considered to be the second largest river system in the United States and is unique among the important waterways of the world in its adaptability to control for the four-fold purpose of flood prevention, irrigation, navigation and power development. Although its outlet is in the desert lands at the head of the Gulf of California, its headwaters lie in the lands of abundant snowfall in the states of Wyoming, Colorado and Utah. Impounding its waters above the proposed dam to be 500 ft. in height would store 93% of the annual run-off. Estimated on the accepted basis of statistics, the increase in community wealth by this development would be equal to the total valuation of California for the year 1920.

## AWARD OF EDISON MEDAL MADE TO DR. M. I. PUPIN.

**Work in Mathematical Physics and Its Application to Electrical Communication Basis of Award—Presentation in February.**

The Edison Medal for 1920 was awarded last month by the Edison Medal committee of the American Institute of Electrical Engineers to Dr. M. I. Pupin, "for work in mathematical physics and its application to the electrical transmission of intelligence." Arrangements will be made for the presentation of the medal to Dr. Pupin at a session of the midwinter convention of the A. I. E. E. in New York City, Feb. 18, 1921.

The Edison Medal was founded by the Edison Medal Association, composed of associates and friends of Thomas A. Edison, and is awarded annually by a committee consisting of 24 members of the American Institute of Electrical Engineers "for meritorious achievement in electrical science, electrical engineering, or the electrical arts."

Michael Idvorsky Pupin was born in 1859 in Hungary, and after completing his education at the village school and showing unusual talents he was sent to Prague to continue his studies. He came to American in 1874, and five years later entered Columbia College, where he graduated with honors in 1883. He then went to Europe to take up graduate work in physics and mathematics at the University of Cambridge and the University of Berlin, and after taking a Ph.D. degree at Berlin returned to Columbia University where, together with Prof. F. B. Crocker, he started in 1889 the electrical engineering department as instructor in mathematical physics.

Dr. Pupin's earliest work was devoted to the study of the passage of electricity through rarefied gases, and several papers concerning the results were published. In 1892 he took up the subject of electrical resonance, which resulted in the invention of the employment of tuned circuits for selective electrical reception of signals. The expression "electrical tuning" was invented by him at that time and is used in the art today. Also resonance analysis by tuned circuits was worked out by him, employing, for means of selectivity by tuning, circuits of variable inductance and variable capacity. The inventions resulting were acquired by the American Marconi Wireless Co. in 1902.

During 1895 and 1896 he developed a method of rectifying both low and high-frequency oscillations so as to make them detectable by d-c. instruments. The rectifier consisted of a polarized electrolytic cell, and it was clear to him at that time that rectification was a very important element in wireless telegraphy, an opinion which has been wonderfully justified by the developments in the wireless art which have taken place within the last 25 years.

The subject of electrical wave transmission over long conductors began to occupy Dr. Pupin's attention as early as 1894, and his earliest work in this direction was chiefly mathematical. It resulted in an extension of the great problem of LaGrange, namely, the problem of analyzing the motion of a stretched weightless string carrying at equal intervals of its length equal masses. Dr. Pupin extended the solution of this problem by supposing that the string itself had weight and that both the string and the masses moved against frictional resistance, taking into consideration not only the free vibrations of the string but also the forced motion produced in it by impressing upon it a simple harmonic force. The solution of this purely dynamical problem suggested immediately its applicability to transmission of electrical waves over telephone wires, and it was obvious that the introduction of suitable inductance coils at predetermined distances along the telephone line would greatly improve the efficiency of transmission by making it possible to transmit the electrical energy carrying the articulate voice of man by high potential and small current, thus reducing ohmic resistance losses on the line. The invention was acquired by the American Telephone & Telegraph Co. in January, 1901, after this company had convinced itself that the invention was capable of performing what the theory had claimed for it. The practical applicability of this invention required a knowledge of making highly efficient inductance coils, using iron cores very finely laminated, and several years' study was devoted to the investigation of these iron losses, resulting in the design of the toroidal coil, known all over the world as the Pupin coil.

During the war Dr. Pupin served on several

national committees connected with war work, particularly the National Advisory Committee for Aeronautics and the National Research Council, and with a government committee for submarine detection. He and his staff were engaged in developing a method of submarine detection by means of very high frequency sound waves sent out by a panel of vibrating quartz plates. Since the wave length of these sound waves in water was small in comparison with the dimensions of the vibrating plate, the sound waves were concentrated in a beam similar to the light beam sent out by a searchlight. The detection consisted in receiving an echo from a submerged submarine, and it is the only means which enables one to detect submarines which are at rest, determining not only the direction but also the distance of the submarine. In prosecuting this work Dr. Pupin developed a multi-step vacuum-tube amplifier which is free from internal noises and which does not transmit low frequency underwater noises. This work is now in charge of the United States Navy.

The principal feature in Dr. Pupin's work in wireless telegraphy is the so-called negative resistance compensator, which according to competent opinion is destined to play an important part in the wireless art.

Professor Pupin is a member of the National Academy of Sciences, National Research Council, Serbian Academy of Sciences, and many other learned societies, and has been a fellow of the American Institute of Electrical Engineers for many years. He has received from the French Academy the Herbert prize in physics, and from the Franklin Institute the Carson gold medal; also the gold medal from the Social Science Association. He also holds honorary degree of doctor of science, Columbia University, and the honorary degree of doctor of laws, Johns Hopkinds University. He is now professor of electromechanics, Columbia University, and a director of the Phoenix research laboratory of the same university.

## PUBLIC OFFERING OF CENTRAL-STATION COMPANY'S BONDS.

The Kansas City Power & Light Co. is issuing through the Continental and Commercial Trust and Savings Bank, Chicago; Halsey, Stuart & Co. and the Guaranty Co. of New York, $10,000,000 first and refunding mortgage 20-year 8% gold bonds, series A, the same being offered at 100 and interest, yielding 8%. The proceeds of this issue of bonds will be used to retire $8,000,000 first mortgage and collateral trust notes due Jan. 21, 1921, (issued mainly in connection with the construction of the new Northeast power plant), and for other corporate purposes.

The total value of the company's properties, as recognized by the Public Service Commission of Missouri for rate-making purposes, is over $7,000,000 in excess of the amount of bonds to be presently outstanding in the hands of the public. The power company serves with electric light and power the city of Kansas City, Mo., and a portion of Kansas City, Kan., the total population served being approximately 430,000. The new northeast power plant of the company is claimed to be one of the most modern and efficient steam-generating stations in the country and is so designed that its present installed capacity of 60,000 kw. may be increased to an ultimate capacity of 240,000 kw.

## INDICTMENT AGAINST UTILITY COMPANY DISMISSED.

According to a decision handed down Dec. 20 by Judge Julius M. Mayer of the United States District Court, the Brooklyn Edison Co. and Walter F. Wells, vice-president and general manager, have been found not guilty of violating the Lever act. The indictment returned Oct. 4 charged the Edison company and Mr. Wells with (1) the hoarding of coal, (2) a conspiracy to pay more than the fair cost of coal by way of bonuses to the Adelphia Coal Co., and (3) a conspiracy to misuse priority permits for the advantage of the B. J. Lynch Coal Co. The first two indictments were dismissed in a previous decision of Judge Mayer, as outlined in the Nov. 20 issue of ELECTRICAL REVIEW, decision being reserved at that time upon the concurrent motions to also dismiss the third indictment, which has now been decided in favor of the Brooklyn Edison Co.

## EXECUTIVE COMMITTEE PERSONNEL OF A. E. S. C.

The American Engineering Standards Committee at its recent annual meeting in New York City re-elected A. A. Stevenson chairman and George C. Stone vice-chairman for 1921, the former representing the American Society for Testing Materials and the latter the American Institute of Mining and Metallurgical Engineers. On the executive committee the following were elected to represent the respective member bodies: N. A. Carle, National Electric Light Association; A. H. Moore, Electrical Manufacturers' Council; C. A. Adams, American Institute of Electrical Engineers; A. W. Whitney, National Safety Council; F. E. Rogers, American Society of Mechanical Engineers; Martin Schreiber, American Society of Civil Engineers; Dana Pierce, fire protection group; A. C. Morrison, gas group; C. F. Clarkson, Society of Automotive Engineers; J. H. Rice, United States War Department; Francis J. Cleary, United States Navy Department; O. P. Hood, United States Department of Interior; E. B. Rosa, United States Department of Commerce, and T. H. MacDonald, United States Department of Agriculture.

## PUBLIC SUPPORT MEANS BRIGHT FUTURE FOR UTILITIES.

**Byllesby Organization Official Comments on Strong Position of Utilities and Gives Views Concerning Causes Effecting Such Results.**

In discussing the public utility situation, Arthur S. Huey, vice-president of H. M. Byllesby & Co., Chicago, recently said: "Utility companies are in a stronger position today than ever before. There is no doubt about it, electric, gas, telephone and even street-railway companies are emerging from these five years of troublous times strengthened in every way. I mean by this that

the greatest obstacle of the past to the proper development of utilities—the misunderstanding existing in the public mind regarding public utilities—has largely disappeared. This has come about as the result of recognition on the part of the public served of the necessity of supporting their utility servants if they are to obtain good and efficient service. They have come to realize also that if they, the public, the industries and the communities served are to grow and prosper, the utilities must have their whole-hearted encouragement first, last and always.

"In the words of Judge Wade, of the United States District Court of Iowa, 'the people will be fair if they only understand, and those who spread misinformation and misrepresentation are guilty of the greatest wrong against the community.' The courts and public utility commissions have assisted in bringing about this realization of the public in a wonderfully effective way, and in airing multitudes of cases have presented clear-cut facts in a fair and impartial manner. If nothing else has been accomplished in these past few years, this has been a great thing—a greater step toward utility efficiency and proper community development than has heretofore been taken.

"Through the examples of starving utility companies and impaired service as a result of inadequate rates, impressed upon the public mind at times of great need, it has come to be realized by a large majority of people that good service is what is needed, efficient, reliable service which can only be rendered by a solvent, healthy company. It has been hard on the companies and a trying lesson for the public, but the ultimate result has been well worth while. Another contribution toward the economic good of the entire country has been the flood light of revelation exposing municipal and governmental ownership in all its glaring inconsistencies. No one who has observed the helpless inefficiencies of many publicly-owned enterprises during the war is likely to again be deceived by their siren-sung theories. The world-wide economic readjustment is taking place in an orderly manner and is having a tremendously favorable effect upon earnings of the utility companies. The dark days of public utilities are over."

## CONTRACTOR-DEALERS ACTIVE EAST AND WEST.

The meeting of the Ohio State Association of Electrical Contractor-Dealers and the recently formed Electrical League of Canton to be held on Jan. 17-18 at Canton, O., will be preceded by a week of intensive lighting demonstrations.

The Wisconsin Electrical Contractors will gather at Milwaukee on Jan. 19-20 for consideration of important matters pertaining to the industry. It is expected that W. L. Goodwin will be one of the speakers.

## JOINT MEETING OF NEW YORK ILLUMINATING ENGINEERS.

Since the adoption of removable standard ceiling and bracket electrical fixtures will develop many new possibilities for the fixture maker, dealer, contractor, builder, landlord, tenant and householder, the New York Section of the Illuminating Engineering Society has planned a joint meeting with the fixture dealers and manufacturers for Thursday evening, Jan. 13, at the Engineering Societies building, 33 West 39th st., New York City.

O. H. Caldwell, McGraw-Hill Publishing Co., will tell "What the Idea Is," while "Its Relation to Better Lighting" will be discussed by M. Luckiesh, Nela Park, Cleveland. Then will follow the presentation of "The Fixture Man's Viewpoint," by W. R. McCoy, Cassidy & Co., and "How It Affects the Contractor-Dealer," by W. J. Shore, electrical engineer.

## COMMITTEE TO INVESTIGATE MOTOR STANDARDIZATION.

The standardization of motors as regards temperature rise, whether 40 deg., 50 deg., or some other limit, and the standardization of large generating and motor equipment using the class B (mica and similar insulation) designation for temperature rise, are subjects to be investigated through a sectional committee of the American Engineering Standards Committee which will be chosen by a special committee, consisting of Prof. D. C. Jackson, chairman; James Burke, Erie, Pa., and L. T. Robinson, Schenectady, N. Y., appointed by the American Institute of Electrical Engineers. It is proposed to appoint on the sectional committee representatives from all interested bodies.

## COMING CONVENTIONS.

Associated General Contractors of America. Second national conference, New Orleans, La., Jan. 25-27. Headquarters, Hotel Grunewald. Secretary, 111 West Washington street, Chicago.

Western Association of Electrical Inspectors. Annual convention, Detroit, Mich., Jan. 25-28. Headquarters, Hotel Statler. Secretary, William S. Boyd, 175 West Jackson boulevard, Chicago.

Pennsylvania State Association of Electrical Contractors and Dealers. Annual convention, Philadelphia Jan. 26-27. Secretary, M. G. Sellers, 1518 Sansom street, Philadelphia.

Association of Municipal Electrical Utilities of Ontario. Semi-annual convention, Toronto, Can., Jan. 27-28.

National Council of Lighting Fixture Manufacturers. Annual convention and lighting fixture market, Elmwood Music Hall, Buffalo, N. Y., Feb. 14-19. Secretary, Charles H. Hofrichter, 8410 Lake avenue, Cleveland.

American Institute of Electrical Engineers. Midwinter convention, Engineering Societies building, New York City, Feb. 16-18. Secretary, F. L. Hutchinson, 33 West 39th street, New York City.

Joint meeting of Illinois State Electric Association, Illinois Electric Railways Association and Illinois Gas Association, Chicago, March 15-17. Headquarters, Sherman House. Secretary, R. V. Prather, Springfield, Ill.

American Electrochemical Society. Spring meeting, Atlantic City, N. J., April 21-23. Headquarters, Hotel Chalfonte. Secretary, Joseph W. Richards, Lehigh University, Bethlehem, Pa.

National Fire Protection Association. Annual convention, San Francisco, June 14-16. Secretary, Franklin H. Wentworth, 87 Milk street, Boston.

North Central Electric Association. Annual convention, Duluth, Minn., June 14-16. Secretary, H. E. Young, 15 South Fifth street, Minneapolis, Minn.

American Institute of Electrical Engineers. Annual convention jointly with the Pacific Coast convention, Salt Lake City, Utah, June 20-25. Secretary, F. L. Hutchinson, 33 West 39th street, New York City.

# NEW APPLIANCES

***Newly Developed and Improved Electrical and Mechanical Apparatus, Appliances, and Devices Now Being Placed on the Market***

## Condensers for Experimental Use.

A line of condensers, designed to appeal particularly to the experimenter, has been placed on the market by the General Apparatus Co., New York City.

**Set of Compact Condenser Units for Experimental Work.**

The three units of the series are called "Grid Condenser, Phone Condenser," and "Grid-Leak and Grid Condenser." The grid condenser is a small condenser intended to be connected in the lead to the grid of a vacuum-tube detector. The grid-leak condenser serves the same purpose as the grid condenser, but in addition is provided with a high-resistance shunt.

## Utility Motor Mounted on Heavy Tripod.

For use on farms and in other places supplied with 32-volt service the Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., has just placed upon the market a 0.25 hp. electric-power stand. This portable motor enables the maximum use to be had from a

**Portable Motor for Low-Voltage Service.**

farm-lighting plant, power as well as light being thus available. The motor is mounted on a substantial tripod base. A telescopic rod is provided to brace the motor and to obtain the proper tension for the belt. The rod is secured on one end through convenient holes provided in the base and the motor frame. The handle on top of the stand makes it easy to carry from place to place.

The main shaft speed is 2100 r. p. m., and the back-geared shaft turns at 250 r. p. m. There are two pulleys on each shaft, a 6.625-in. flat pulley and a 2.75-in. grooved pulley being permanently attached to the slow-speed shaft. A 1.5-in. flat pulley and a 2-in. grooved pulley are supplied for the high-speed shaft, these two pulleys being fastened onto the shaft by means of a set screw. The flat pulleys take a 1-in. flat belt, and the groove pulleys take a 0.375-in. and a 0.188-in. round belt on the slow and high-speed shafts respectively.

Much time and labor can be saved by the use of such a motor around the farm. It may be used to drive a grindstone, feed grinder, root cutter, water pump, horse clippers, fanning mill, clothes washer, cream separator, butter churn, sausage grinder, food cutter, ice cream freezer, or other device. Many devices can be equipped with this back-geared motor mounted permanently. For permanent mounting a standard sliding base in supplied.

## Polarized 20-Ampere Composition Plug Cap.

The body of the No. 6720 plug cap, now being placed on the market by Harvey Hubbell, Inc., Bridgeport, Conn., is made of tough black composition with

**Polarized Plug Cap for Heavy Service.**

a large milled edge supplying an excellent grip for the fingers. The hole is big enough to admit weatherproof or asbestos-covered wire, while a generous space is provided for knotting the two cords to prevent strain on the contact screws. A disk of black fibre locks down over these contacts and will not slide forward on the blades.

The cap has a capacity of 20 amperes at 250 volts, ample for all 32-volt farm-lighting circuits. The blades are of heavy brass, set "polarized," are interchangeable with all Hubbell 20-ampere receptacles, and will not work loose or bend easily.

## Electric Cigar Lighter for Store or Home Use.

The Duralectric Corp., Jamestown, N. Y., is marketing an electrically operated cigar lighter for use on ordinary circuits. The commercial lighter is built to withstand hard service on the cigar counter, and its all-metal construction with standard finish of grained mahogany to give it a desirable appearance. The type AC lighter shown in the accompanying illustration consumes 40 watts.

The "Duralectric Midget" is a small lighter of the same general appearance, but intended for use in the home. It is

**Cigar Lighter Operated From Lighting Circuit.**

finished in mahogany and supplied with cord and plug for attachment. The energy consumed while in use is about half the amount required in the commercial size.

## Metal Display Cabinet for C-H Switches.

Display of the C-H 70-50 switches is said to be greatly enhanced by the metal display cabinet shown in the accompanying illustration. This cabinet is being distributed by The Cutler-Hammer Manufacturing Co., Milwaukee, to many dealers in these switches. The cabinet consists of a lower and upper compartment, each capable of holding a complete carton of ten switches. The carton in the upper compartment is covered with glass so that the switches may be kept clean and in

**Cabinet for Display of Appliance Switches**

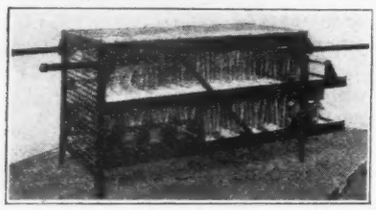
plain view of the customer. The switches may also thus be displayed on the counter in perfect safety. The

metal display panel is mounted on top of the cabinet proper and is held in place by two upright rods supported from the rear of the cabinet. The panel shows a C-H 70-50 switch attached to a toaster cord and another on an iron cord, each being shown in an oval insert. In the center is a switch and hand with the caption, "Tells When the Current Is On." This is all attractively displayed in three colors. Rubber nubs on the bottom of the cabinet protect the surface of the counter.

The cabinet makes a neat and attractive display, and will aid materially in selling a C-H 70-50 switch with each of the many toasters, irons, percolators and other appliances sold.

## Resistance-Controlled Arc-Welding Equipment.

The General Electric Co., Schenectady, N. Y., has developed an arc-welding equipment incorporating new features, and especially adapted for welding rail bonds on street or industrial railways. It is also applicable to welding work in industrial plants where the use of electrical energy in a considerable quantity is not objectionable. The apparatus consists of a wire resistance unit mounted



Regulating Unit for Arc-Welding Equipment.

in a light metal frame with suitable leads for connecting to the power-supply circuit and to the electrode holder. Switches provide a welding current with range of from 60 to 200 amperes in 15-ampere stops. The complete device is light, easily portable by two men, and will not be injured by exposure to the weather.

The circuit is controlled through a contactor operated by means of a push-button switch located close to the electrode holder. This arrangement permits the operator to open the circuit at a point remote from the weld and thus avoid flashing. This push-button switch is normally open so that the electrode holder is not alive unless the operator holds the switch closed by pressure from his hand or foot.

## Resistance Box of Flat-Coil Construction.

The resistance coils in the flat-coil resistance box now being made by the Pyrolectric Instrument Co., Trenton, N. J., are wound in the form of discs. These discs are wound to be only of one or two-wire thicknesses, and are rendered entirely self supporting by being dipped in a hard nonhydroscopic wax. The coils are made by a machine, winding two wires between two discs. These discs are clamped together with the coil between and are then placed in a bath of the wax which is superheated to a point sufficient to thoroughly age the wire, thus taking out the strains incident to winding. After the aging period is completed the discs and coils together are removed from the hot wax and, after cooling, the coils are separated out. They are then adjusted and the coils are complete. No shellac or other varnish of any description is used.

The coils as wound are noninductive, but have the usual capacity of a bifilar winding which, for all commercial frequencies, is small enough to be ignored. One form of coil has been designed to be marketed at a later date in which complete control is obtained over the inductance and capacity, and with which it is possible to so adjust the residual capacity and inductance that for any given frequency a pure resistance results. If this frequency is high practically a perfect resistor for any frequency met in practice is obtained. Ten coils are used in a decade unit. These coils are arranged on a spool with bakelite ends and a brass core. One end of this pool serves to hold the contact studs to which the ends of the coils are soldered. The coils are separated by three-pronged separators and are held a distance of approximately 3 mm. apart. This spool containing the coils is slipped over a brass shaft which extends through a bushing and projects above the hard-rubber top of the box.

The end projecting above the top carries the knob and indicating pointer, which latter indicates the resistance in circuit by means of the values engraved in the top. Directly beneath the top is the positive clicking device and current collector. The end projecting through the spool carries the contact brushes which bear on the studs. The entire spool is readily removed by taking off the contact brushes and unsoldering two connections. By this means decades can be given any value desired, and if in the future the user wishes a pure resistance in one or more decades, possibly for conductivity or radio work, only the coil spools need be secured and fitted to the existing box. The clicking device is positive, and it is not necessary to look at the box to be certain the proper contact is being made. The knob can be rotated continuously in either direction and the "feel" is the same for all settings of the dial.

This form of coil winding and mechanical arrangement has many advantages. The radius around which the coil is bent is comparatively great, thus reducing to a minimum the strains induced by winding. This makes the aging process easier, and the coil is more likely to maintain its original accuracy. Practically all of the wire is available for radiating the heat produced by the current flowing, thus giving the coil ample radiating surface and considerably more than is possible with a spool-wound coil. The coils can be immersed in oil without injury to the wax. As no shellac is used, the coils are not subject to changes in resistance due to varying humidity—a fault which has often been noticed in some types of coils.

As this form of coil permits the use of ten coils in the decade without too great a cost, many of the advantages of the full decade system are obtained. Obviously it is more desirable to use such a box than one containing nine-value decades. As the knob is rotated to obtain successively greater or lesser resistance values, these values are attained by successive equal increments or decrements. It may be used potentially as part of a potentiometer set-up, or as a potential divider. Many other advantages are easily apparent when planning a piece of research work.

The mechanical arrangement is such that the user can easily replace the entire coil decade without any special tools or the touching of the resistances proper. In this way boxes may be modified to suit the work in hand. They offer a type of unit construction and interchangeability heretofore not obtainable.

All of the coils in the present boxes, except the 0.1 and 1-ohm coils, are adjusted to within 0.05%. The 0.1 and 1-ohm coils depart from the flat-coil construction and are adjusted to within 0.1%.

There are made and now available resistance boxes of this flat-coil type with from one to five decades per box and of the usual coil values ranging from 0.1 ohm to 1000 ohms. Two Wheatstone bridges using this same form of construction, each with ten ratio coils, are available; one is supplied with a five-dial rheostat and the other with a four-dial rheostat.

Briefly stated, this form of flat-coil resistance box has the following advantages over the other types: It has very small mass, so that final coil temperature is attained in a few seconds, all parts of coil being accessible to the air; it has large radiating surface, giving large wattage capacity to the coils; there are no resistance fluctuations with air humidity; the average radius of winding is large, with consequent freedom from mechanical straining of wire; there are ten coils to the decade, giving overlapping values with consequent rapid adjustment to exact setting of desired value at all values. A unit system of construction is used, making possible any combination and assembly of decade units without increased cost involved by special construction, and there is great compactness of boxes. ten values occupying but a minimum of space.

## Mercury Contactor That Fits Into Fuse Clips.

The Absolute Con-Tac-Tor Co., Chicago, has placed on the market a hermetically sealed circuit-breaking device which can be used as a switch or to make and break an electric circuit rapidly. The contactor consists of a glass tube containing a quantity of mercury, an inert gas and two central electrodes with a gap between. The electrodes are connected to outside brass caps at each end of the tube. The simplest type of these contactors is operated by being tilted so that the mercury makes and breaks the circuit between the electrodes. In the relay form of construction the necessity of tilting is eliminated by the use of a hollow iron cylinder which is lined with an inner sleeve of porcelain. The gap between the electrodes is inside of the iron cylinder.

## Meter-Reading Device.

For use on watt-hour and polyphase meters the Economy Appliance Co., Waterloo, Ia., is now manufacturing a meter-reading and recording device. A clock is provided for operating the device at any specified time for recording the meter reading on a card especially made for that purpose.

# ACTIVITIES IN THE TRADE

***Business Developments, Sales Agencies, Trade Literature and Miscellaneous Items Concerning Electrical Manufacturers and Allied Business Interests***

**Burke Electric Co.**, Erie, Pa., plans to erect a one-story addition to its plant at a cost of $28,000.

**Sterling Lighting & Fixture Co.**, Buffalo, N. Y., is planning to increase its capital stock to $25,000.

**Continental Radio & Electric Corp.**, New York City, is planning to increase its capital stock from $30,000 to $60,000.

**American Electrical & Maintenance Co.**, Philadelphia, has announced the removal of its offices and factory to more commodious quarters at Cherry and Quarry streets.

**Baldor Electric Co.**, St. Louis, has announced that it will shortly begin the manufacture of 3- and 5-hp., 60 cycle, six-pole, 110/120-volt, repulsion-type, single-phase motors.

**J. Livingston & Co.**, 70 East 45th street, New York City, manufacturer of electrical equipment, with fixture department on East 41st street, has filed notice of increase in capital stock from $600,000 to $1,000,000.

**Western Electric Co.** presented motion-picture reels depicting the cedar-pole industry—from forest to finished pole—at a meeting of the Technical Publicity Association at the Machinery Club, New York City, Dec. 16.

**National Screw & Tack Co.**, Cleveland, has taken over the business of the Adams-Bagnall Electric Co., manufacturer of lamp reflectors, fans and small motors, and the plant of the Adams company will hereafter be operated as the AB Products Division of the National Screw & Tack Co.

**Ilg Electric Ventilating Co.**, Chicago, manufacturer of self-cooled motor-propelled fans, blowers, exhausters, automatic shutters, air-conditioning apparatus, etc., has recently moved into its new plant at 2850 North Crawford avenue, where larger facilities have been provided for its manufacturing operations.

**Elliot Electrical Supply Co.**, 68 West 116th street, New York City, has had plans prepared for improvements in its five-story building.

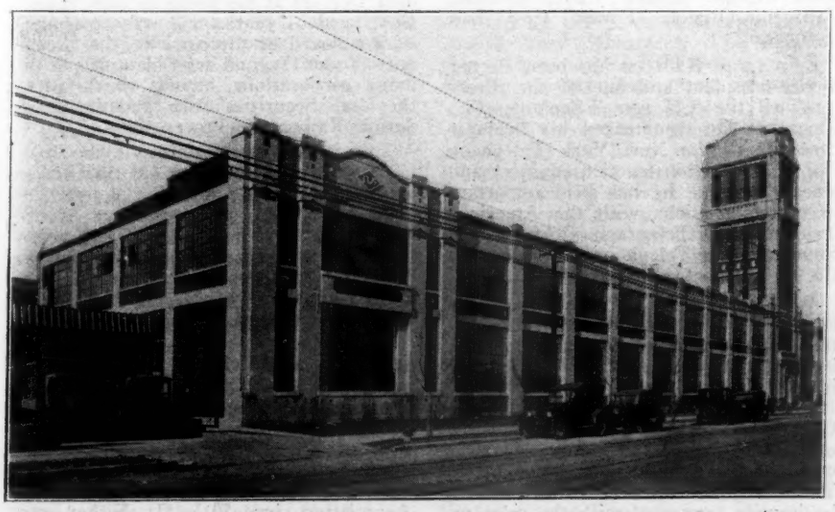
**Duplex Lighting Works of General Electric Co.**, 6 West 48th street, New York City, has secured the contract for lighting the 21-story Cunard building, 25 Broadway, and 4000 to 5000 "Duplexalite" units will be installed.

**Anderson Electric & Equipment Co.**, 154 Whiting street, Chicago, has issued a booklet illustrating and describing its "Autoreelite," a combination of three lamps in one, a spot light, trouble light and portable light for automobiles.

**Shapiro & Aaronson**, 245 Glenmore avenue, Brooklyn, N. Y., manufacturers of electric-lighting equipment, fixtures, etc., have construction under way on a one-story addition to their local plant at Glenmore avenue and Hinsdale street, to cost about $45,000.

**National X-Ray Reflector Co.**, Chicago, has announced that Cochrane, Stephenson & Co., Ltd., 602 Avenue block, Winnipeg, Man., has been appointed its sales representative for western Canada. Mr. Cochrane is well known in the Canadian West, having been sales manager of the Northern Electric Co. in that territory for 12 years.

**Conveyors Corp. of America**, Chicago, has announced the appointment of the Hallidie Machinery Co., L. C. Smith building, Seattle, Wash., as its representative for the sale of the American steam conveyor and American trolley carrier in the states of Washington and Oregon. The Hallidie firm was organized some 20 years ago, its present officers being as follows: President, Philip Rowe; vice-president, W. S. Dyson; secretary, Archie McLean, and treasurer, George Henderson.



New Building of Ilg Electric Ventilating Co., Chicago.

**Emerson Electric Manufacturing Co.**, St. Louis, has elected the following officers: Chairman of the board of directors, H. L. Parker; president, T. M. Meston; first vice-president, H. I. Finch; second vice-president, E. L. Barkhouse; third vice-president, C. C. Connor; secretary, L. L. Whittemore, and treasurer, H. S. Gilliam.

**Hugro Manufacturing Co.**, Warsaw, Ind., has announced a consolidation of its interests with those of the Remmert Manufacturing Co., St. Louis. Vacuum cleaners will be manufactured at the Warsaw plant, and the St. Louis factory, which will be known as the Remmert branch of the Hugro Manufacturing Co., will continue the manufacture of washing machines. Headquarters will be at Warsaw.

**Frank F. Fowle & Co.**, Chicago, electrical and mechanical engineers, has announced that owing to the ill-health of one of his family, James R. Cravath has found it advisable to move to California, making necessary the dissolution of the firm of Fowle & Cravath. However, the new firm of Frank F. Fowle & Co. will continue the business at the same address. The advisory services of Mr. Cravath in illuminating engineering matters will still be available, as he will retain a connection with the new firm for that purpose.

**Cutler-Hammer Manufacturing Co.**, Milwaukee, has issued a folder descriptive of its electric tailors' flat irons. This folder, known as publication 877, explains why electric heat is superior to other forms of heat for this class of work. The C-H tailors' flat iron is described as having a specially constructed heating unit which extends the full length of the base and quickly brings the iron to the desired temperature. It is claimed that the iron does not overheat while in use, and the handle remains cool, making the use of a hand-pad unnecessary. Four sizes of flat irons ranging in weight from 12 to 22 lbs. are listed, with their wattage ratings, shipping weights, etc.

**Ward Electric Co.**, Philadelphia, manufacturer and exporter of electrical specialties and supplies, has made the following announcement under date of Dec. 17: "The Machen Electric Manufacturing Co. of this city has written to several publications, stating that it has purchased the manufacturing branch of the Ward Electric Co. This information, as published in one or two of the journals, would lead one to believe that we have discontinued our activities. We would inform you that the Machen Electric Manufacturing Co. has purchased no part whatsoever of the Ward Electric Co., but is endeavoring to close a deal which has not been closed at this writing, taking over the Ward-Stoddard Co., a corporation which manufactured push-button switches only for us."

# PERSONAL MENTION

***Biographical Sketches and Chronicle of Changes in Business Connections, Promotions and Other Personal News of the Industry***

E. F. COLLINS, General Electric Co., delivered an address Dec. 21 on the subject of "Industrial Application of Electric Furnaces," before the Buffalo Section of the American Society of Mechanical Engineers.

A. R. KELLEY, formerly consulting engineer, specializing on valuations of public utility properties, with headquarters in San Francisco, has joined the organization of the Southern California Edison Co., Los Angeles, in charge of the newly established department of estimates and valuations.

ADAM GSCHWINDT, who was recently elected president of the Illinois State Electric Association, is vice-president and general manager of the Rockford (Ill.) Electric Co., which position he has held since June, 1913. He was born in East Stroudsburg, Pa., and early in life entered the employ of the steel mills at Scranton. In 1903 he became connected with the steam-heating field as fireman for the Economy Light, Heat & Power Co., advancing rapidly to the position of general superintendent, and in 1907, when the Economy company merged with the Scranton Electric Co., had built up the business of the former to such an extent that it became known as the largest steam-heating plant in the country, serving over 1000 customers. In 1909 Mr. Gschwindt was called to the trusted and responsible position of purchasing agent by the American Gas & Electric Co., New York City, and was subsequently given the additional positions of engineer of the steam-heating department

**Adam Gschwindt.**

and editor of the company's monthly bulletin. In June, 1913, he was promoted to the position of vice-president and general manager of the Rockford Electric Co., which is controlled by the American Gas & Electric Co.

R. S. WHALEY has resigned as manager of the Rainier Heat & Power Co., Seattle, Wash., to become vice-president and manager of the Power Plant Engineering Co.

J. D. KUSTER, formerly manager for Santa Clara county of the Pacific Gas & Electric Co., San Francisco, has been appointed manager of the San Jose division of the company.

PAGE GOLSAN has become associated with Ford, Bacon & Davis, engineers, New York City. He was formerly connected with the Great Western Power Co., San Francisco.

V. D. BUTLER has been appointed superintendent of the 15,000-kw. hydro-electric plant of the Portland Railway, Light & Power Co., located on the Bull Run river east of Portland, Ore.

CARL C. DEGENHARDT, who is connected with the bond department of H. M. Byllesby & Co., Chicago, recently addressed the securities salesmen of Morris F. Fox & Co., Milwaukee.

J. G. MENUT, formerly manager of the Pennsylvania Utilties Co. and the Easton Gas Works, Easton, Pa., has been appointed general manager of the Vermont Hydroelectric Corp., Rutland, Vt.

W. J. SANTMYER, superintendent of steam and advisory engineer of the Puget Sound Traction, Light & Power Co., Seattle, Wash., has been elected president of the Power Plant Engineering Co., Seattle.

C. M. MARRON, formerly district superintendent of the American District Telegraph Co. at San Francisco, has been promoted to the position of general manager of the company with headquarters in New York City.

O. O. ALENDERFER has become connected with A. B. Cunningham in the business of the People's Electric Store, Medford, Ore. Mr. Alenderfer was formerly in charge of commercial sales of the Rogue River division, California-Oregon Power Co., San Francisco.

EDGAR S. BLOOM has been elected a vice-president and one of the directors of the Chicago Telephone Co., Chicago. He commenced his business career with the New York Telephone Co. in 1897 as construction engineer and since that time he has held important executive positions with the American Telephone & Telegraph Co. and the Southwestern Telephone & Telegraph Co.

W. H. COLMAN, who was recently elected president of the Electric Club of Chicago for the year 1921, has been prominent in electrical affairs in the Chicago district for over 30 years. He entered the employ of the Edison General Electric Co. at its Chicago office in October, 1890, and after the consolidation of that company with the Thompson-Houston Electric Co. in 1892 he became connected with the sales organization. Mr. Colman has been interested in the commercial part of the electrical business with the same company since that time, occupying the position of assistant manager of the supply department when F. N. Boyer was manager and B. E. Sunny was district

**W. H. Colman.**

manager. For the last ten years Mr. Colman has been district manager of the supply department and has made a host of friends in the electrical fraternity.

## OBITUARY.

H. DOUGLAS, accountant of the Canadian Westinghouse Co., Ltd., Montreal, Can., died Dec. 4, at the age of 36 years.

ALEXANDER J. HEMPHILL, died Dec. 29 at his home in New York City, aged 64 years. He was chairman of the board of directors of the Guaranty Trust Co. and was identified with many corporations, among which were the Utah Securities Corp. and the California Railway & Power Co.

JOHN T. CHAMBERS, who had been connected with the Georgia Railway & Power Co., Atlanta, Ga., for 29 years, died Dec. 12 at the age of 52 years. His first position with the company was in the capacity of oiler and by merit he had won various promotions and at the time of his death he was chief engineer of steam-power plants.

ERNEST B. FISHER died Dec. 16 at his home in Grand Rapids, Mich., aged 73 years. As organizer of the Citizens Telephone Co. of Grand Rapids, which he served in official capacities for some 20 years, and as chairman of the board of directors of the United States Independent Telephone Association since 1915, Mr. Fisher was actively interested in telephone affairs.

# BUSINESS OPPORTUNITIES

***News of Electrical Construction Projects in All Parts of the Country, Proposals Invited, Foreign Trade Openings and New Companies***

## EASTERN STATES.

**Lewiston, Me.**—The Androscoggin Electric Co. will soon award the contract for the erection of its proposed two-story building, 25 by 50 ft., on a local site. Plans have been prepared by J. A. Greenleaf & Sons Co., Auburn, Me.

**Claremont, N. H.**—The Sullivan Machinery Co., manufacturer of mining machinery, has completed the installation of a new two-ton electric furnace. Service for operation will be furnished by the Vermont Hydro-Electric Corp. The utility company has recently completed a number of improvements in its power plant at Rutland.

**Somerworth, N. H.**—Construction work is under way on an electric power plant at the textile works of the Great Falls Manufacturing Co. The structure and machinery is estimated to cost about $500,000. The Aberthaw Construction Co., 27 School street, Boston, Mass., has the building contract.

**Cambridge, Mass.**—The Cambridge Electric Light Co. has awarded a contract to Walsh Brothers, 150 Hampshire street, for the erection of a brick and steel automobile service building, 50 by 82 ft., on Albia street, to be used for company motor trucks and cars. The structure with equipment will cost about $27,000.

**Lawrence, Mass.**—Ways and means are being discussed for the erection of a new "white way." Mr. Wade is city clerk.

**Lee, Mass.**—The Tayford Co., Inc., 154 Nassau street, New York City, will soon commence the erection of a hydroelectric power plant on the Housatonic river, near Lee, to be used for industrial power service in this section. The new station with machinery is estimated to cost about $150,000.

**Bridgeport, Conn.**—The lamp committee will make recommendation that about 10 arc and 8 tungsten lights be installed in parts of the city now inadequately lighted.

**New Haven, Conn.**—The United Electric Illuminating Co., 128 Temple street, has broken ground for the erection of a power-house addition on Grand avenue, 65 by 80 ft., to cost about $60,000.

**New London, Conn.**—The International Radio & Telegraph Co. has construction under way on its proposed radio station on Pequot Island, and plans for the early installation of equipment and operation of the plant.

**Providence, R. I.**—The Narragansett Electric Lighting Co. will defer the erection of its proposed service building at Melrose and Russell streets until early in the spring. Bids for construction will be asked at that time. Jenks & Ballou, Grosvenor building, are architects.

**Mountaindale, N. Y.**—The Mountaindale Electric Light & Power Co. Capital stock, $10,000. To operate an electric light and power plant. Incorporators: H. Goldstein, S. Wingard and F. J. Garden.

**Brooklyn, N. Y.**—The Kings County Lighting Co., 4802 New Utrecht avenue, has filed plans for extensions in its two-story plant at First avenue and 55th street, to cost about $58,000.

**Buffalo, N. Y.**—A number of conferences have been held by the City Council with officials of the Niagara Power & Development Co. relative to the proposed power project at Niagara Falls. In accordance with present agreement, the city will pay $15.00 per hp. if the plant costs $85.00 a hp., and $17.50 if the plant cost is $100.00. Another power company, the Niagara Gorge Power Co., has opened up negotiations with the city, tendering a proposition to furnish the necessary power.

**Buffalo, N. Y.**—The city council is considering the installation of high-power pumping machinery, electrically operated, at the Colonial Ward pumping station, for use in connection with the fire department, and to eliminate the present use of fireboats. The proposed installation is estimated to cost $400,000.

**Corning, N. Y.**—The Corning Light & Power Corp. has been granted permission by the Public Service Commission to issue bonds for $39,000, the proceeds to be used for extensions and improvements in its plant.

**Long Beach, L. I. City, N. Y.**—The board of trustees has made application to the Public Service Commission for permission to construct and operate a municipal electric power plant, including a distributing system. Bonds were voted recently for $200,000 for the project.

**New York, N. Y.**—The New York Edison Co. will furnish service for the new 14-story building now being erected by the S. & G. Realty Co. at 213-33 West 35th street. The installation will comprise 5000 lamps and 350 hp. for elevator and pump operation.

**North Tonawanda, N. Y.**—The Tonawanda Power Co. is planning the extension of its lines in the Witmer Road section, to furnish service for residents in the district. It is proposed to commence the work early in the spring, and assurances have been given the city officials that the extensions will be carried out as planned. E. F. King is manager.

**Tonawanda, N. Y.**—The Republic Light, Heat & Power Co. is planning to reopen its plant on East Niagara street, for local service. The company has not been operating at this station for some time past.

**Troy, N. Y.**—Henry Ford & Son, Ford Motor Co., Detroit, have been granted permission by the Federal Water Power Commission, Washington, D. C., to utilize government waters at Green Island, near Troy, for the construction and operation of their proposed hydroelectric power plant. The new plant, estimated to cost $2,225,000, will be located in the vicinity of the Federal dam. The installation will comprise six water turbines, each capable of developing 1350 hp., direct-connected to electric generators, each with a rating of 1000 kw. In connection with the new power station, the company will build a large plant for the manufacture of farm tractors, motor parts, etc., and the electric service will be used for the operation of these factories. Plans for the electric generating plant have been prepared by Stone & Webster, engineers, 147 Milk street, Boston.

**Watertown, N. Y.**—A syndicate of paper manufacturers, headed by the St. Regis Paper Co., has bought a controlling interest in the Northern New York Utilties, Inc., of this city. The nine hydroelectric plants of the utilities company are to be consolidated with the power development of the paper companies.

**Hoboken, N. J.**—Electric equipment will be installed in the new incinerating plant to be erected by the city at a cost of about $50,000. The city commission is in charge.

**Hopewell, N. J.**—The borough council is planning improvements and extensions in the local street-lighting system. New lamps will be installed in different sections. The Public Service Electric Co. is furnishing local service.

**Jersey City, N. J.**—The board of commissioners of Hudson county will make extensions and improvements in the county electric light and power plant at Snake Hill. Thomas J. Wasser is county engineer.

**Newark, N. J.**—The Public Service Electric Co. has awarded miscellaneous contracts for improvements in its electric generating plant at Point-No-Point.

**Perth Amboy, N. J.**—In connection with its new dry dock and repair shops, the Perth Amboy Dry Dock Co., foot of Broad street, will install an improved flood lighting system and general plant lighting system to allow operations during a twenty-four-hour period. It is proposed to have the addition to the shipyard ready for service early in March.

**Perth Amboy, N. J.**—In its 1921 appropriation budget, the board of aldermen is arranging a fund of $32,000 for street-lighting and lamps, including lighting in public buildings.

**Weehawken, N. J.**—The Cunard Steamship Co., 24 State street, New York, will defer the awarding of contract for its proposed new freight terminal here until some time during the coming year. The project will include a number of piers and warehouses, with large central electric power plant; electric-traveling cranes, hoisting, conveying and other electrically operated machinery will be

installed. The new terminal is estimated to cost about $30,000,000.

**Harrisburg, Pa.**—A number of public utilities have made application to the Public Service Commission for permission to issue securities in amount noted for proposed extensions and improvements, as well as for general operations. These are: Dillsburg Light, Heat & Power Co., Dillsburg, $18,500; West Penn Power Co., Pittsburgh, $18,000; Lower Chanceford Electric Light, Heat & Power Co., Sunnyburn, $5000; Kulpmont Electric Co., Kulpmont, $5000; Mt. Carmel Township Electric Co., Mt. Carmel, $5000; Panther Valley Electric Co., Lansford, $360,000; and Shenango Valley Traction Co., Sharon, $350,000.

**Harrisburg, Pa.**—The city council is arranging an appropriation of $16,959 for the municipal electric bureau for 1921, for underground line extensions and other work. New electric street lamps will be installed in different parts of the city.

**Johnstown, Pa.**—The Conemaugh Power Co. has filed application with the Public Service Commission for permission to issue bonds for $2,750,000 and stock for $2,015,500, the proceeds to be used in part for proposed extensions and improvements in electric power plants and system.

**Lewistown, Pa.**—The Penn Central Light & Power Co. is constructing a transmission line on West Hale street.

**Middleburg, Pa.**—The Middleburg Light, Heat & Power Co. is arranging for a merger of six electric companies operating in Perry, Snyder and Union counties with its organization, retaining the present company name.

**Philadelphia, Pa.**—Electrical and mechanical equipment, refrigerating machinery, etc., will be installed in the new plant to be erected by the American Ice Co., 6th and Arch streets, at Tenth and Callowhill streets.

**Philadelphia, Pa.**—The Department of Public Works is planning for the purchase of the garbage plant of the Penn Reduction Co. for municipal operation at a cost of $500,000. It is said that upon acquisition, extensions and improvements will be made, including the installation of electrically operated equipment. Frank H. Craven is director of the department.

**Reading, Pa.**—The Metropolitan Edison Co. has made application to the Public Service Commission for permission to issue bonds for $52,500, the proceeds to be used for plant extensions and general expansion.

**Baltimore, Md.**—The Consolidated Gas, Electric Light & Power Co. has arranged for a bond issue of $5,000,000, the bulk of the proceeds to be used during the coming year for electric generating plant extensions and line betterments, including transmission and distributing system. The company has plans under way for the erection of an addition to its plant on Front street, as well as for a new one-story plant extension at Madison and Graves streets.

**Baltimore, Md.**—The Lafayette Mill & Lumber Co., Pulaski and Lafayette streets, is planning for the erection of a new power house at its property.

**Baltimore, Md.**—The United Railways & Electric Co. has filed plans for the erection of an addition to its power house at Light and Heath streets. The company is planning for the establishment of a new car storage works on a tract of property at Eastern avenue and Fifteenth street, acquired some time ago.

**Hagerstown, Md.**—The Hagerstown & Frederick Railway Co. is arranging details with the Antietam Light & Power Co. for furnishing power in blocks for local distribution by the latter company at Antietam and vicinity, including Boonsboro, Keedysville and Sharpsburg. It is said that the Hagerstown company will not purchase the present plant of the Antietam company, as originally projected.

**Washington, D. C.**—W. H. Stineman, Gunther building, and Alfred M. Quick, Equitable building, are organizing a company to construct and operate a hydroelectric power plant on the Potomac river. The initial plant will have a capacity of about 25,000 hp. Application for permission to utilize waters has been made to the Federal Power Commission.

**Portsmouth, Va.**—The city has plans under way for the installation of an electric power plant. W. L. Davis is engineer and J. P. Jervey is manager.

**Kinston, N. C.**—Construction will be placed under way at once on the proposed new municipal electric light and power plant, estimated to cost about $275,000 with machinery. Joseph Dawson is mayor.

**Lenoir, N. C.**—The Catawba Valley Light & Power Co. of Morgantown will build a hydroelectric plant on Wilson Creek.

**Newton, N. C.**—The borough council is planning improvements in the municipal electric light and power plant. Bonds for $14,000 have been voted.

**Pinetops, N. C.**—The city council has approved a bond issue of $25,000 for the installation of a municipal electric lighting plant. It is proposed to commence construction at an early date.

**Greer, S. C.**—The commissioner of public works will soon ask for bids for the construction of a new electric transmission line from Greer to Fairforest, S. C. A pole line will be constructed, operating at 44,000 volts. A fund of $40,000 is available for the construction. W. N. Willis, Spartansburg, S. C., is engineer for the project.

**Manchester, Ga.**—Bonds in the sum of $50,000 have been voted by the city, for street, sewer, water and electric light improvements. The mayor is in charge.

**Boynton, Fla.**—The city contemplates a $10,000 bond issue for the purpose of improving the lighting facilities and the bay front.

**Gainesville, Fla.**—Bonds in the sum of $20,000 have been voted for the purpose of improving the municipal light and power plant. The city clerk is in charge.

**Sarasota, Fla.**—Bonds in the sum of $35,000 have been voted for electric light extension. The mayor is in charge.

**St. Petersburg, Fla.**—The city will vote on the question of issuing $65,000 in bonds for extending the municipal street railway lines. The mayor is in charge.

## NORTH CENTRAL STATES.

**Ashtabula, O.**—Bonds have been voted and engineers are preparing plans for an addition to the electric lighting plant, including 5000 kw. generators.

**Hamilton, O.**—The arc lights will be replaced by incandescent lamps, when the ordinance issuing $50,000 in bonds has been passed. Jas. O'Toole is city electric light superintendent.

**Middletown, O.**—The installation of an ornamental street lighting system for the business section of the town, will be brought up together with other contemplated improvements, before an informal discussion of the city commission.

**Wapakoneta, O.**—Bonds in the sum of $110,000 have been authorized for the purpose of purchasing electrical energy from the Western Ohio Railway Co. Robert B. Anderson is president of the Chamber of Commerce.

**Lansing, Mich.**—The Michigan Soldiers' Home Board will ask the state budget committee to include a provision of $185,000 for the construction of a power and heating plant. The secretary of the Soldiers' Home is in charge.

**Marion, Mich.**—Burd & Giffield, architects, Kelsey building, Grand Rapids, have prepared plans for the erection of a water power plant for the Winterfield Light & Power Co. The cost is estimated at $90,000. W. L. Kinney is in charge.

**Muir, Mich.**—The Gardner Lighting Co. was given the franchise for furnishing Pewamo with electric lights. The work will be pushed as rapidly as possible. Glenn Gardner is manager.

**Richmond, Ind.**—A one-story municipal electric power plant, 75 by 85 ft., to cost about $175,000, is to be erected here, bids for which are being received by W. Stevens, city clerk. J. D. Lyon, Union Central building, Cincinnati, is the engineer.

**Valparaiso, Ind.**—The Valparaiso Lighting Co. will make improvements on its plant in this city, including a distribution system. The cost is estimated at $30,000. R. J. Cory is manager.

**Beardstown, Ill.**—Bids will be received Feb. 15 by the Board of Commissioners, care of J. H. Bowman, for the construction of a drainage and power plant. The cost is estimated at $175,000. Goodell & Millard are engineers.

**Big Falls, Wis.**—E. Meyers Co., 53 West Jackson boulevard, Chicago, plans to develop hydroelectric power on the Flambeau river, Big Falls, Wis.

**Marshfield, Wis.**—The Marshfield Farm Electric Co. has been organized with a capital of $12,000. The purpose of the company is to deal in farm lighting equipment and other electrical devices. J. P. O'Connell is interested.

**Sparta, Wis.**—The Wisconsin-Minnesota Light & Power Co. is contemplating improving and enlarging its plant.

**Wausau, Wis.**—The railroad com-

mission has issued an order, granting the Wisconsin Valley Improvement Co. authority to construct and maintain a storage dam on Spirit river in the northern part of Lincoln county. W. E. Brooks is manager.

**Hopkinton, Ia.**—The Hopkinton Electric Light & Power Co., of which W. A. Millroy is president, has had plans prepared for the erection of a power plant to cost about $35,000. Holland, Ackerman & Holland, engineer, 122 North 4th avenue, Ann Arbor, prepared the plans.

**Kirkham, Ia.**—Bonds in the sum of $6000 have been voted for the installation of an electric lighting system. C. B. Tucker, city clerk, is in charge.

**Prescott, Ia.**—Bids will be received Dec. 20th for a transmission line to cost about $12,000. J. P. Martin is mayor.

**Eminence, Mo.**—The Western Tie Timber Co. of St. Louis will build a hydroelectric plant on Current river; a transmission line to Poplar Bluffs; construct steel towers and other facilities between the power plant and Poplar Bluff, a distance of 75 miles. The cost is estimated at $400,000.

**Jefferson City, Mo.**—The Missouri Gas & Electric Service Co. plans extensions and improvements in its electric plauts at Liberty, Lexington, Marshall and Richmond.

**Kansas City, Mo.**—The Kansas City Power & Light Co. has perfected plans for a bond issue to total $10,000,000, the proceeds to be used in part for extensions and improvements in electric generating plants and system. Joseph F. Porter is president.

**Topeka, Kan.**—The specifications for the two units to be added in the consolidation of the electric light and water plants will commence immediately. Bids will be asked on a 500-kw. turbo unit; a 250-hp. boiler; 20,000 lbs. copper wire, and other materials costing about $15,000. Fred A. Painter is water superintendent.

**Rugby, N. D.**—The business men of the town will purchase an electric lighting plant, for which they will spend $15,000.

## SOUTH CENTRAL STATES.

**Paducah, Ky.**—The city council has plans under way for the installation of equipment in the municipal power plant for increased capacity.

**Millington, Tenn.**—The town council has plans under way for the establishment of a municipal electric lighting plant to cost about $20,000. Bonds for this amount will be voted.

**Anniston, Ala.**—The Alabama Power Co. will reconstruct the Noble street line at a cost of $40,000. R. A. Mitchell is in charge.

**Meridan, Miss.**—Preliminary plans are under way for the establishment of a municipal electric lighting plant. The common council is arranging a charter amendment to provide for the installation. A bond issue will be voted.

**Cotton Point, Ark.**—The Arkansas Hydro-Electric Co. has arranged for an increase in capital from $500,000 to $5,000,000. The company is having plans prepared by the J. E. Sirrine Co., engineer, Greenville, S. C., for the construction of a hydroelectric generating station on the Little Red river, vicinity of Higden. It is proposed to inagurate construction in the spring. R. R. James is president.

**Ballinger, Tex.**—The city is having plans prepared for the erection of a municipal electric lighting plant.

**Mexia, Tex.**—The Central Texas Ice, Light, Power & Water Co. and the Central Texas Light and Water Co. have merged into one company, The Central Texas Ice, Light & Water Co., with a capital of $300,000. Improvements will be made at the plant. Joseph Nussbaum of Galveston is president.

**Pecos, Texas**—Pecos Power & Light Co. Capital stock, $30,000. To operate a local electric light and power plant and system. Incorporators: J. W. Crowdus, and M. E. Heiderkorn.

**San Antonio, Tex.**—The Hot Wells Mineral Bath & Hotel Co. will build a dam across the San Antonio river, for a hydroelectric plant to develop 140 hp.

**Snyder, Tex.**—The Snyder Utilities Co. has plans under way for extensions and improvements in its local electric power plant.

**Sweetwater, Tex.**—The city has plans under way for the erection of an electric lighting plant.

**Weatherford, Tex.**—In order to have the business district of Weatherford well lighted, the City Commission is submitting a proposition to the merchants to furnish the electric current and keep the lines repaired, provided they will pay the expense of installing the necessary poles.

## WESTERN STATES.

**Ilwaco, Wash.**—The matter of subscribing funds for the construction of an electric lighting plant is being considered.

**Portland, Wash.**—City Commissioner Pier has been authorized to ask for bids for street lighting. As the charter now stands the council has authority to enter into a contract for street lighting for a period of five years.

**Prosser, Wash.**—The Pacific Power & Light Co. will improve the water system at this place.

**Stanislaus, Cal.**—The railroad commission has been petitioned by the Sierra and San Francisco Power Co. and the Pacific Gas & Electric Co. for authority to erect an electric power house at Spring Gap. The energy will be conducted from the Spring Gap power house over a transmission line approximately 18 miles in length to the Stanislaus power house, where connections will be made to conduct the energy to bay districts.

**Visalia, Cal.**—The Southern California Edison Co. has plans for the development of 1,000,000 hp. of electrical energy, a considerable amount of which will be allocated to the development of agricultural lands in the San Joaquin valley. The cost is estimated at $200,000,000. R. H. Ballard, of Los Angeles, is general manager of the company.

## CANADA.

**Grande Prairie, Alta.**—The plant of the Grande Prairie Electric Co. will be taken over by the city Jan. 1. It is planned to construct an additional power unit in the spring.

## INCORPORATIONS.

**Inwood, N. Y.**—Rockaway Gas & Electric Appliance Co. Capital, $20,000. To manufacture electrical appliances, etc. Incorporators: A. A. Wiley, J. E. Smith and others.

**Wilmington, Del.**—B. W. Electric Co. Capital, $500,000. To manufacture electrical products. Incorporators: S. E. Dill, T. L. Croteau, M. A. Bruce and others.

**Cleveland, O.**—Revolving Transformer Co. Capital, $100,000. To manufacture electrical apparatus. Incorporators: James H. Griswold, David E. Green, John C. Lincoln and others.

**Bloomfield, N. J.**—Titan Miniature Lamp Co., 281 Glenwood avenue. To manufacture electric lamps. Incorporators: F. M. Merrick, 182 Bay avenue, Glen Ridge, N. J., and others.

**Detroit, Mich.**—The C. & D. Manufacturing Co. Capital, $50,000. To manufacture washing machines and other mechanical laundry equipment. Incorporators: A. B. Eggert, Ray J. Corrigan, 59 Glendale avenue, G. T. DuBois and others.

**Milwaukee, Wis.**—Wisconsin Electric Welder Co. Capital, $150,000. To manufacture electric welding and cutting apparatus. Incorporators: E. H. Mills, G. F. Runge, Walter L. Poppe, 434 Cass street, and others.

**Los Angeles, Cal.**—Electric Sign Flasher Corp. Capital, $50,000. To manufacture electric flashing devices and other electrical apparatus. Incorporators: M. H. Mahana, Jr., Albert Andrews, G. T. Mahana, and others.

**Boston, Mass.**—Knight-Chase Co. Capital, $20,000. To manufacture electrical storage batteries and appliances. Incorporators: John Knight, 100 Queensbury street, and others.

**New York, N. Y.**—Sokol Motor Co. Capital, $300,000. To manufacture motors, engines, etc. Incorporators: A. E. Claffy, P. D. Benson and W. W. Reeves.

**Los Angeles, Cal.**—Stewart Electric Manufacturing & Sales Co. Capital, $250,000. To manufacture electrical products. Incorporators: C. M. Parker, R. E. Stewart and others.

**Montreal, Can.** — Perkins Ladd Electric Co., Ltd. Capital, $75,000. To manufacture electrical machinery, motors, appliances, etc. Incorporators: Harold E. Walker, Henry M. Chauvin, Richard T. Hencker and others.

## PROPOSALS.

**Dannemora, N. Y.**—The Dannemora State Hospital, Dr. John R. Ross, medical superintendent, will take bids up to Jan. 5, for fans, motors, heaters and other electrical and mechanical equipment at the institution.

**Baltimore, Md.**—John L. Hanson, superintendent of lamps and lighting, will receive bids Jan. 5 for plain and ornamental iron lamp posts.

**Washington, D. C.**—The Office of General Purchasing Officer, The Panama Canal, Washington, will receive bids Jan. 5 for copper wire, steel wire, electric motors, electric toasters, etc.

# FINANCIAL NEWS

***Comment on the Financial Outlook in the Electrical Industry, New Securities, Reports of Earnings, Dividends and Utility Stocks***

### Offering of Metropolitan Edison Co. Bonds.

Halsey, Stuart & Co., Chicago, are offering an issue of $1,000,000 Metropolitan Edison Co. refunding and improvement mortgage 8% gold bonds, Series A, due Nov. 1, 1935, at 95.82, yielding 8½%. This company supplies electric light and power service in Reading and Lebanon, Pa., and 64 other adjacent communities. A territory of great wealth, industrial activity and stability, and a particularly good field for the operation of an electric light and power business. The earnings for the twelve months ended Oct. 31, 1920, with other income adjusted to present investments, were reported as follows:

| | |
|---|---|
| Gross earnings (including other income) | $2,815,189.27 |
| Operating expense, rentals and taxes | 1,959,632.15 |
| Net earnings | $ 855,577.12 |
| Annual interest on refunding and improvement and underlying bonds outstanding with public, including this issue, requires | $ 458,225.00 |

### Yearly Earnings of Allis-Chalmers Manufacturing Co.

The earnings of Allis-Chalmers Manufacturing Co. for the year ending Dec. 31, 1920, are now estimated around $9 a share for the $26,000,000 common, after taxes and other charges. In 1919 earnings were $9.57 a share. In the last four years earnings on the common have aggregated over $40 a share, of which $39 a share has been kept in the treasury. The company will carry over into 1921 a minimum of $18,000,000 unfilled orders, which is except for Dec. 31, 1917, the largest bulk of forward business of any year's end in its history.

### Increase in Cities Service Co.'s Shareholders.

The distribution of Cities Service Co. bankers' shares to be made Jan. 1 will be made to 16,914 shareholders of record. This is an increase of 1,278 shareholders of record over the number to which distribution was made Nov. 1 last and an increase of 11,378 shareholders of record since Jan. 1, 1920, the number of shareholders on that date having been 5538.

### Alabama Power Co.

| | 1920. | 1919. |
|---|---|---|
| October gross | $ 394,420 | $ 275,142 |
| Net after taxes | 161,682 | 129,806 |
| Twelve months' gross | 3,990,487 | 2,949,125 |
| Net after taxes | 2,063,750 | 1,575,927 |

Note: Increased operating expense, due to dry weather, necessitating increased steam production.

### Central Mississippi Valley Electric Co.

| October— | 1920. | 1919. |
|---|---|---|
| Gross earnings | $ 42,764 | $ 37,261 |
| Net earnings | 10,698 | 6,073 |
| Surplus after charges | 7,822 | 3,541 |
| Twelve months ending Oct. 31— | | |
| Gross earnings | 485,098 | 403,271 |
| Net earnings | 117,042 | 82,620 |
| Surplus after charges | 84,488 | 53,122 |

### Mississippi River Power Co.

| | 1920. | 1919. |
|---|---|---|
| October gross | $ 237,865 | $ 211,194 |
| Net earnings | 185,634 | 169,914 |
| Surplus after charges | 84,936 | 67,752 |
| Twelve months' gross | 2,656,467 | 2,277,950 |
| Net earnings | 2,067,869 | 1,773,372 |
| Surplus after charges | 951,765 | 538,741 |

### Reading Transit & Light System.

| | 1920. | 1919. |
|---|---|---|
| October gross | $ 254,716 | $ 224,473 |
| Net after taxes | 10,963 | 33,469 |

### Pacific Gas & Electric Co.

| For ten months ended Oct. 31 last: | | |
|---|---|---|
| Gross earnings | $28,914,815 | $7,200,386 |
| Net revenue | 8,444,993 | 1,116,247 |
| Surplus after depreciation reserve | 3,291,875 | 502,354 |
| Balance after preferred dividends | 1,783,193 | 273,442 |

### Cities Service Co.

| | 1920. | 1919. |
|---|---|---|
| November gross | $1,942,230 | $1,613,081 |
| Net earnings | 1,880,792 | 1,557,869 |
| Surplus after interest charges | 1,729,583 | 1,406,457 |
| Balance after preferred dividends | 1,329,661 | 1,047,427 |
| Eleven months' gross | 22,871,546 | 18,219,928 |
| Net earnings | 22,231,677 | 17,577,681 |
| Surplus after interest charges | 20,464,370 | 15,823,590 |
| Balance after preferred dividends | 16,179,698 | 11,980,914 |

### Columbia Gas & Electric Co.

The Columbia Gas & Electric Co. for November and twelve months ended Nov. 30, reports earnings as follows: Comparison is made with November, 1919, and the previous twelvemonth period:

| | | Increase. |
|---|---|---|
| November gross | $1,335,202 | $ 236,459 |
| Net after taxes | 877,221 | 160,834 |
| Surplus after charges | 452,898 | 140,547 |
| Twelve months' gross | 14,634,468 | 2,779,369 |
| Net after taxes | 9,916,869 | 2,258,734 |
| Surplus after charges | 4,831,550 | 1,883,989 |

### Great Western Power System.

| | 1920. | 1919. |
|---|---|---|
| November gross | $ 766,428 | $ 581,781 |
| Net after taxes | 470,213 | 324,737 |
| Surplus after charges | *281,476 | 158,993 |
| Eleven months' gross | 5,874,325 | 4,873,160 |
| Net after taxes | 3,232,662 | 2,788,663 |
| Surplus after charges | *1,323,226 | 1,140,263 |

*Includes accrued dividends on California Electric Generating Co. preferred stock of $12,500 for the month and $137,500 for the eleven months.

### Tennessee Power Co.

| | 1920. | 1919. |
|---|---|---|
| October gross | $ 221,817 | $ 183,930 |
| Net after taxes | 68,326 | 43,259 |
| Surplus after charges | 16,335 | *11,181 |
| Twelve months' gross | 2,409,889 | 2,240,848 |
| Net after taxes | 988,306 | 904,538 |
| Surplus after charges | 347,208 | 258,106 |

*Deficit.

### New England Co. Power System.

| | 1920. | 1919. |
|---|---|---|
| October gross | $ 533,506 | $ 401,609 |
| Net after taxes | 147,415 | 186,656 |
| Surplus after charges. | 79,402 | 129,474 |
| Twelve months' gross. | 5,834,482 | 4,038,894 |
| Net after taxes | 1,573,317 | 1,452,120 |
| Surplus after charges. | 776,534 | 690,073 |

### Southern Utilities Co.

| | 1920. | 1919. |
|---|---|---|
| November gross | $ 192,791 | $ 151,721 |
| Net after taxes | 23,592 | 23,390 |
| Total income | 23,701 | 23,926 |
| Surplus after charges. | 5,843 | 7,635 |
| Twelve months' gross. | 2,560,906 | 1,924,038 |
| Net after taxes | 464,107 | 225,844 |
| Total income | 465,297 | 227,042 |
| Surplus after charges. | 250,279 | 38,208 |

### Utah Securities Corp. and Subsidiaries.

| | 1920. | 1919. |
|---|---|---|
| November gross | $ 843,500 | $ 661,621 |
| Net earnings | 438,841 | 348,148 |
| Twelve months' gross. | 8,453,325 | 7,251,109 |
| Net earnings | 4,018,087 | 3,743,111 |

### Dividends.

| | Term. | Rate. | Payable. |
|---|---|---|---|
| Col. Elec., pfd. | SA | $3.00 | Jan. 3 |
| Pac. Gas & Elec. | Q | 1.25 | Jan. 15 |
| Pub. Serv., N. J. | Q | 1.00 | Dec. 31 |
| Puget Sound P. & L., pfd. | Q | .75 | Jan. 15 |
| West India Elec. | Q | 1.25% | Jan. 2 |
| Westinghouse | Q | 2% | Jan. 31 |
| Westinghouse, pfd. | Q | 2% | Jan. 31 |
| Wis. Edison | .. | 1.50 | Dec. 31 |

WEEKLY COMPARISONS OF CLOSING-BID PRICES OF SECURITIES OF LEADING ELECTRICAL COMPANIES.

Quotations furnished by F. M. Zeller & Co., Rookery Bldg., Chicago.

| | Div. rate. Per cent. | Bid Dec. 21. | Bid Dec. 28. |
|---|---|---|---|
| Public Utilities— | | | |
| Adirondack Electric Power of Glens Falls, common | 6 | 11 | 10 |
| Adirondack Electric Power of Glens Falls, preferred | 6 | 70 | 70 |
| American Gas & Electric of New York, common | .. | 93 | 94 |
| American Gas & Electric of New York, preferred | 6 | 32 | 32 |
| American Light & Traction of New York, common | .. | 90 | 65 |
| American Light & Traction of New York, preferred | 6 | 76 | 66 |
| American Power & Light of New York, common | 4 | 45 | 39 |
| American Power & Light of New York, preferred | 6 | 58 | 58 |
| American Public Utilities of Grand Rapids, common | .. | 6 | 6 |
| American Public Utilities of Grand Rapids, preferred | 7 | 18 | 15 |
| American Telephone & Telegraph of New York | .. | 96 | 95 |
| American Water Works & Elec. of New York, common | .. | 1 | ½ |
| American Water Works & Elec. of New York, particip | 7 | 4 | 4 |
| American Water Works & Elec. of New York, 1st preferred | .. | 36 | 35 |
| Appalachian Power, common | .. | 2 | 1½ |
| Appalachian Power, preferred | 7 | 18 | 16 |
| Cities Service of New York, common | +extra | 250 | 231 |
| Cities Service of New York, preferred | 6 | 63 | 62 |
| Commonwealth Edison of Chicago | 8 | 101 | 101 |
| Comm. Power, Railway & Light of Jackson, common | .. | 4 | 9 |
| Comm. Power, Railway & Light of Jackson, preferred | 6 | 31 | 29 |
| Federal Light & Traction of New York, common | .. | 5 | 5 |
| Federal Light & Traction of New York, preferred | .. | 43 | 42 |
| Northern States Power of Chicago, common | .. | 34 | 33 |
| Northern States Power of Chicago, preferred | ex.div.7 | 75 | 74 |
| Pacific Gas & Electric of San Francisco, common | .. | 45 | 45 |
| Public Service of Northern Illinois, Chicago, common | 7 | 58 | 57 |
| Public Service of Northern Illinois, Chicago, preferred | 6 | 78 | 75 |
| Standard Gas & Electric of Chicago, common | .. | 9 | 9 |
| Standard Gas & Electric of Chicago, preferred | 8 | 30 | 29 |
| Tennessee Railway, Light & Power of Chattanooga, common | .. | ½ | ¼ |
| Tennessee Railway, Light & Power of Chattanooga, preferred | 6 | 1½ | 1½ |
| Western Power of San Francisco, common | .. | 18 | 18 |
| Western Union Telegraph of New York | extra | 83 | 84 |
| Industrials— | | | |
| Electric Storage Battery of Philadelphia, common | 4 | 98 | 97 |
| General Electric of Schenectady | 8 | 118 | 117 |
| Westinghouse Electric & Mfg. of Pittsburgh, common | 7 | 42 | 41 |